

CHAPTER 2.0 ALTERNATIVES

As discussed in Chapter 1.0, Purpose of and Need for the Project, this Draft EIS was prepared in accordance with the requirements of NEPA and the Corps' Section 404 regulations. This chapter identifies the regulatory setting for the alternatives analysis with regard to NEPA and the Section 404(b)(1) guidelines. Additionally, this chapter presents the range of alternatives considered, the screening criteria used, and the analysis of the range of alternatives, and it identifies those alternatives carried forward for detailed analysis. Finally, this chapter summarizes the environmental impacts of the alternatives considered in detail.

2.1 REGULATORY SETTING FOR ALTERNATIVES ANALYSIS

The Corps is required to consider alternatives to the NDOR's Applied-for Project that would avoid impacts on waters of the U.S. Alternatives must be reasonable in order for them to be evaluated. Reasonable alternatives are those that are practical or feasible from the technical and economic standpoint and using common sense rather than simply desirable from the standpoint of the applicant. Reasonable alternatives give the decision maker a clear basis for choice.

The following provides an over view of interrelatedness of NEPA guidance and the Section 404(b)(1) guidelines that the Corps applies to identify the alternatives analyzed in this Draft EIS.

2.1.1 National Environmental Policy Act

The NEPA process is intended to help public officials make decisions that are based on understanding of environmental consequences and take actions that protect, restore, and enhance the environment (40 CFR 1500). Generally, the requirements of NEPA are procedural in nature, and the Council on Environmental Quality's (CEQ's) Regulations for Implementing the Procedural Provisions of NEPA (40 CFR 1500-1508) are followed in this EIS. The Corps uses 33 CFR 325, Appendix B, NEPA Implementation Procedures for the Regulatory Program, for guidance for implementing NEPA.

NEPA requires that the EIS "rigorously explore and objectively evaluate all reasonable alternatives." (40 CFR 1502.14) "Reasonable alternatives include those that are practical or feasible from the technical and economic standpoint and using common sense rather than simply desirable from the standpoint of the applicant" (CEQ 2007). The purpose of comparing the various reasonable alternatives is to give the decision maker a clear basis for choice. While NEPA seeks to provide the decision maker with the information to make a wise and informed decision, it does not dictate what the decision should be.

Both the CEQ NEPA Implementation Procedures (40 CFR 1502.14) and the Corps NEPA Implementation Procedures require consideration of a range of reasonable alternatives for a project. Defining a range of reasonable alternatives is a key element for subsequent analysis in an EIS. CEQ (40 CFR 1502.14) describes the alternatives as being the "heart of the environmental impact statement" and alternatives that are considered reasonable under NEPA include those alternatives "that are practicable or feasible from a technical and economic standpoint and using common sense". NEPA regulations require that agencies consider a range of reasonable alternatives for a project, including the consideration of a "No Action" alternative. The regulations do not require consideration of every conceivable variation of an alternative.

2.1.2 Section 404(b)(1) Guidelines

The substantive criteria used by the Corps to evaluate a permit are the Section 404(b)(1) guidelines (40 CFR 230). Fundamental to the Section 404(b)(1) guidelines is “the precept that dredged or fill material should not be discharged into the aquatic ecosystem, unless it can be demonstrated that such a discharge would not have an unacceptable adverse impact either individually or in combination with known and/or probable impacts of other activities affecting the ecosystems of concern” (40 CFR 230.1(c)).

The Section 404(b)(1) guidelines provide a pass or fail test rather than serving as a disclosure requirement. The Corps must determine which alternatives are truly practicable and can then, based on the range of practicable alternatives, authorize (issue a permit) only the one that does the least damage to the aquatic ecosystem (FR, vol. 46, no. 55, March 25, 1981.) The Corps can only authorize the LEDPA (40 CFR 230.10(a)), unless other significant environmental consequences exist. The difference between a NEPA analysis and the Section 404(b)(1) guidelines is that the Section 404(b)(1) guidelines becomes a decision-making tool rather than a decision aid as with the NEPA document.

The Section 404(b)(1) guidelines indicate that the analysis of alternatives for NEPA environmental documents will in most cases provide the information required to evaluate the alternatives under the guidelines (40 CFR 230.,10[a][4]). The Section 404(b)(1) guidelines require the evaluation of “practicable alternatives”, and define an alternative as practicable “if it is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes” (40 CFR 230.10[a][2]).

2.1.3 Alternatives Screening

The Corps is the lead federal agency responsible for both NEPA and complying with the Section 404(b)(1) guidelines. The Corps and cooperating agencies examined a full range of possible alternatives to systematically arrive at the alternatives presented in this Draft EIS. The Corps, in cooperation with the cooperating agencies, evaluated and screened the alternatives mindful of both the NEPA requirements and the Section 404(b)(1) guidelines. As a result, the range of reasonable alternatives presented in this section forms the starting point for the evaluation of practicable alternatives to NDOR’s Applied-for Project. Through this process, the Corps believes it has captured all of the alternatives necessary to review the Applied-for Project under the Section 404(b)(1) guidelines for a determination of the Applied-for Project as the LEDPA.

2.2 ALTERNATIVE DEVELOPMENT

The Corps implemented a structured multistep process to develop and screen alternatives to the Applied-for Project with the goal of identifying a range of reasonable and practicable alternatives that would be analyzed in this Draft EIS. Each step of this process was designed to build upon the previous step by using more refined and detailed information. The intent of the iterative process was to eliminate unreasonable (and not practicable) concepts and alternatives as early in the process as possible to allow for the Corps, cooperating agencies, and NDOR to focus on reasonable alternatives.

The initial step in the process was identification of possible alternative concepts for achieving the purpose of the Project (Chapter 1). During the public scoping meeting, a number of comments were made regarding the management of the Mainstem System and subsequent sediment management as a method to solve the flooding problem. The Corps and cooperating agencies developed concepts to reflect these comments, along with concepts for roadway solutions that would address the project purpose.

The concepts were reviewed for their ability to meet the Corps' overall project purpose, and the logistical and technological feasibility of the concepts. A range of alternatives for the concepts that were not eliminated were then developed. The Corps held routine monthly meetings as well as other meetings as needed with NDOR to attain details regarding the NDOR's Applied-for Project as well as technical information regarding the development of the full range of alternatives. In all cases, the information supplied by NDOR was reviewed and verified by the Corps.

The full range of alternatives were then screened by the Corps (with input from the cooperating agencies) to determine the practicable alternatives under the Section 404(b)(1) guidelines, and therefore the reasonable alternatives under NEPA (see Section 2.3). This Draft EIS documents the Corps' detailed evaluation of environmental impacts of these alternatives as well as the NDOR's Applied-for Project, and the No-Action Alternative (see Section 2.2.3, Range of Alternatives).

2.2.1 General Concepts

To begin the process of identifying alternatives, four general concepts were considered by the Corps. Each of these general concepts (A through D) could serve as a solution for the project.

Concept A, Roadway Alignments in the Missouri River Floodplain

Concept A considers roadway improvements within the Missouri River floodplain. In order to relieve the flood hazard currently associated with N-12, Concept A includes construction of a roadway raised to an elevation approximately 9 feet above the water surface elevation of the Missouri River during the 100-year flood event based on year 2045 Missouri River conditions and/or potential ice conditions on the west and east segments, respectively (HWS Consulting Group, Inc. [HWS] 2008). Additional or larger bridges and/or culverts to create a piered roadway would be considered as a part of Concept A. Concept A could be implemented on the existing N-12 alignment or on a new alignment within the floodplain; this concept would use existing N-12 through Niobrara, including the existing crossing of the Niobrara River. Regardless of the concept alignment, the resulting roadway would be constructed to meet existing NDOR design standards and to facilitate an adequate LOS to east-west traffic in northeast Nebraska. When possible, traffic would use the existing N-12 during construction to minimize traffic disruption during construction. Traffic control measures in the form of signage, barriers, and temporary signals, would be implemented as needed during construction.

Concept B, Roadway Alignments not in the Missouri River Floodplain

Because road construction is not inherently water dependent, the Corps requested, in accordance with Section 404 regulation, that NDOR develop an upland alternative to avoid or minimize impacts on wetlands and waters of the U.S. Concept B considers shifting the current N-12 alignment to a new alignment for which the majority of the roadway would lie outside of the Missouri River floodplain. Concept B would inherently eliminate the existing flood hazard and would facilitate an adequate LOS to east-west traffic in northeast Nebraska. This concept would use existing N-12 through Niobrara, including the existing crossing of the Niobrara River. In addition, Concept B would allow traffic to use existing N-12 during construction; therefore, traffic disruption would be minimized during construction. The resulting roadway would be constructed to meet existing NDOR design standards; however, modifications to standard roadway templates may be required to minimize the landslide potential associated with constructing on the Pierre Shale geologic formation, as discussed below.

The bluffs south of the Missouri River floodplain contain the Pierre Shale geologic formation from 0 to 72 feet below the ground surface. The Pierre Shale geologic formation is documented as being susceptible to landslides, especially in northeastern Nebraska and eastern South Dakota. In combination with the Pierre Shale geologic formation, the following conditions occur in northeast

Nebraska and facilitate increased landslide occurrence: 1) the topography is sloping to rugged; and 2) northeast Nebraska has 22.75 inches of precipitation per year (U.S. Climate Data 2015).

The Pierre Shale geologic formation has engineering properties that make it prone to failure (such as sliding or sloughing) even in mildly sloping conditions. First, shale bedding is not flat, but has a slight dip that varies. Second, the shale is thin-bedded clay; however, the mineralogy of the Pierre Shale is not uniform and can contain seams of silty sand to bentonite. The combination of bedding and differing mineralogy allows for planes of weakness and a path for water to flow into the formation. The result is a potential for mass failure (such as a landslide).

To construct a roadway in the area of the Pierre Shale geologic formation, an extensive geotechnical investigation would be required to determine locations where the formation would be contacted. Following the investigation, a modified roadway design template would need to be implemented to minimize the landslide risk associated with the formation. Specific design modification would include:

- Decreasing embankment side slopes from the standard 3H:1V to 4H:1V (HWS 2009)
- Removing (over-excavation) and disposing of shale material (shale would not be re-used as fill in an alternate location)
- Benching or terracing the side slopes to provide stabilization
- Implementing methods of slope protection
- Constructing water drainage systems

Concept C, Missouri River Mainstem System Regulation Changes

Concept C considers the potential for regulation changes for the Mainstem System with the intent of minimizing or reducing water levels and/or sedimentation in the Lake. This concept includes altering release rates from Fort Randall Dam to manage sediment accumulation in the Fort Randall reach near the Niobrara River, altering release rates from Gavins Point Dam to reduce Lake sediment accumulation levels, and/or eliminating Gavins Point Dam entirely.

Concept C consists of two general methods for reducing sediment in the Missouri River to ultimately reduce Missouri River water levels: 1) using Missouri River flows to scour or move sediment downstream; and 2) decommissioning or removing Gavins Point Dam. For the first method to be effective in the long term, a release of sufficient magnitude and duration to effectively move sediment out of the Study Area is required. Regulation of the Mainstem System is accomplished by the Corps' Northwestern Division and is subject to the protocols defined in the Master Manual (Corps 2006). The Master Manual was most recently updated and adopted in 2004 for the purpose of systematically operating the mainstem Missouri River dams and reservoirs for their authorized purpose.

The second method of sediment management involves the decommissioning or removal of Gavins Point Dam, which would require a detailed feasibility study that, upon completion, would be presented to the U.S. Congress. Only upon an act of the U.S. Congress could dam decommissioning or removal be authorized.

Concept D, Lewis and Clark Lake Sediment Removal

Concept D considers the potential for removing accumulated sediment from the Lake through mechanical removal such as dredging. This alternative would require Federal Water Resources Development Act authorization for funding. Should funding be authorized, a dredging protocol and operational procedure would be established and a location(s) for dredged sediment disposal would be

identified. Taking into account that this concept does not deter sediment from entering the Lake via Missouri River tributaries; it is estimated that 500 acre-feet (approximately 800,000 cubic yards) of contributing sediment from the Niobrara River would need to be dredged each year in order to maintain the existing condition (Corps 2008).

Following the proposed implementation of an alternative as part of Concept D, and assuming that alternatives as part of this concept would result in lower water levels sufficient to relieve the flood hazard and maintenance problem, NDOR would still have to add shoulders and flatten the embankment slope on the existing alignment to achieve consistency with current NDOR design standards.

2.2.2 Concept Screening

Each concept was reviewed for issues that could preclude development of potential alternatives, as described below.

Concepts A and B, Roadway Alignments in and out of the Missouri River Floodplain

From a conceptual perspective, no issues were identified that would preclude Concepts A and B from being considered. Alternatives were developed for these concepts and are presented in Section 2.2.3, Range of Alternatives.

Concept C, Missouri River Mainstem System Regulation Changes

Any potential alternatives associated with Concept C would be outside the authority of NDOR to implement because NDOR has no authority with respect to regulation of the Mainstem System. NDOR would need to resolve the design deficiencies associated with the existing roadway. Therefore, a permit application would be required. Because pursuit of such an alternative would require decisions by Corps offices other than the Omaha District Regulatory Branch as well as potential revision of the Master Manual, a separate NEPA evaluation would have to be conducted in support of that decision. Further, resolution of design deficiencies by NDOR would be dependent on the Corps' final changes to the operation of the Mainstem System or Gavins Point Dam as well as any resultant changes on regulated waters of the U.S. Consequently, that concept is not being considered in this EIS.

The Corps operates the Mainstem System to serve Congressionally authorized purposes of flood control, navigation, irrigation, hydropower generation, water supply, water quality, recreation, and fish and wildlife (National Research Council 2002). A release of water from Fort Randall Dam of the magnitude and duration necessary to move accumulated sediment is dependent on an adequate quantity of water available in the Mainstem System above Fort Randall Dam. In addition, the amount or magnitude of flow would need to be coordinated with downstream tributary flows and forecasted rainfall to reduce downstream flood risk. Therefore, the release rates are dependent on both downstream basin hydrologic conditions and Mainstem System storage, and a specific plan tied to a certain timetable could likely not be implemented. However, a plan that takes advantage of favorable downstream hydrologic conditions and high Mainstem System storage accumulation as they occurred would be feasible. The issue would be that the frequency of those years occurring related to the number of years necessary to move the sediment volume would be inadequate, especially during prolonged drought periods.

Re-allocating flows of the magnitude and duration necessary to move sediment during non-high water years creates a conflict in management goals between some of the authorized purposes of both the Fort Randall and Gavins Point dams and is dependent on downstream water levels. Releasing flows of the magnitude and at the intervals necessary to reduce and then maintain acceptable sediment

levels to control flooding of N-12 may require these releases to occur when there is not sufficient water available in the Mainstem System for release downstream. The Master Manual has established criteria to assure water conservation during drought years in order to balance the impacts on all Congressionally authorized purposes. A proposal to make a change in the Master Manual for the sole purpose of controlling the flooding of N-12 would require an evaluation of the impacts on all authorized purposes, coordination among all stakeholders within the Missouri River basin of the proposed change, comply with NEPA requirements, and approval and publication of any change in a new water control manual.

For these reasons, there is no certainty that regulation changes would be approved and implemented; therefore, there is no certainty that this concept would solve the existing problems with N-12. The request could be made through the Missouri River Recovery Implementation Committee (MRRIC) process but appears to be beyond the scope of adaptive management.

Pursuit of any alternatives involving dam decommissioning or removal would require a similar evaluation and approval with no certainty that Congress would approve such decommissioning or removal; therefore, there is little certainty that this concept would solve the existing problems with N-12.

Therefore, there is no ability to ensure that the necessary rate of releases to control sediment accumulation could be consistently delivered at the appropriate times or at all on a yearly basis. In addition, regulating the Mainstem System with several competing authorized purposes is a complex undertaking with no guarantee that this concept would be approved and implemented. For these reasons, this concept has been eliminated from further consideration, and alternatives based on this concept were not developed.

Concept D, Lewis and Clark Lake Sediment Removal

Concept D would require funding for sediment removal, such as dredging. In addition, it is assumed that as alternatives under this concept would result in reducing water levels sufficient to relieve the flood hazard and maintenance problem, NDOR would still have to modify the road (add shoulders and flatten the embankment slope on the existing alignment to achieve consistency with current NDOR design standards).

No implicit traffic disruptions would result from dredging activities; however, should hauling of dredged sediment be required, truck traffic required to haul dredge material off-site would be substantial and may slow traffic through the Study Area.

As discussed in Section 2.5.1, Practicability Screening Criteria, cost is a factor in screening for practicability. Annual dredging costs are estimated at up to \$86 million per year, every year (not including the initial capital investment to be made in equipment and infrastructure nor adjusting for inflation). These costs are to dredge the annual sediment load of 4.3 million cubic yards of sediment annually. As 2045 Missouri River conditions were used to establish the elevation for which elevations of roadway alternatives under Concept A would be designed to, the cost of dredging the annual sediment load for the next would be approximately \$2.58 billion (30 years based from 2015). Dredging the annual sediment load does not regain any storage capacity in the Lake nor does it reduce the accumulated sediment that would decrease water levels and subsequent roadway overtopping. For example, it would require 60 years at a rate of twice the annual dredging requirements (roughly 8.6

What is adaptive management?

“Adaptive management is a decision-making process that promotes collaboration, flexible decision-making, and learning from the outcomes of management actions. This decision-making process ultimately leads to more effective decisions and enhanced benefits from projects” (Missouri River Recovery Program n.d.).

million cubic yards) to remove enough sediment to reach the original storage volumes of the reservoir as constructed in 1955. Increased excavations rates would result in increased annual dredging costs (Boyd 2015). In addition, the dredging costs do not include the costs to resolve the design deficiencies associated with the existing roadway or the costs to dispose of the dredged material. Due to the high cost of implementing this concept, it has been eliminated from further consideration, and alternatives based on this concept were not developed.

2.2.3 Range of Alternatives

For Concepts A and B, described above, the Corps and NDOR identified alternatives, called Alternatives A1, A2, A3, B1, and B2. In accordance with the Section 404(b)(1) guidelines, the Corps would consider and analyze a range of alternatives for improving N-12 in the Study Area. NDOR is responsible for the preliminary design of the alternatives. The full range of detailed alternatives is discussed below.

No-Action Alternative

Evaluation of the No-Action Alternative is required in an EIS (40 CFR 1502.14(d) and 1508.25(b)). The No-Action Alternative is used as a benchmark for comparison of the environmental effects of the Action Alternatives. Under the No-Action Alternative, for comparative purposes, it is assumed that neither the Applied-for Project nor any of the Action Alternatives would be implemented. In this scenario, it is assumed that NDOR would continue to maintain N-12 for traffic and make improvements to correct the design deficiencies that have been created due to past flood events. Maintenance activities that impact jurisdictional wetlands or other waters of the U.S. would require a federal action from the Corps. Actions within the 39-mile District of the MNRR that impact jurisdictional wetlands or other waters of the U.S. would require a federal action from the Corps and/or NPS. These federal actions would require compliance with NEPA and would be evaluated on each independent action. Future maintenance activities associated with the No-Action Alternative requiring a federal action are not evaluated in this Draft EIS.

Under the No-Action Alternative, the overall purpose of the project—to provide a reliable transportation link on N-12 between Verdel and S-54D that eliminates existing roadway deficiencies caused by operations of Fort Randall and Gavins Point dams and that safely accommodates current and projected traffic levels while maintaining regional connectivity—would not be met. Flooding associated with the Missouri River and the Lake, which has resulted in an unreliable roadway, safety concerns, and an interruption in regional connectivity, would not be remedied.

The flooding of N-12 in the Study Area due to Missouri River sedimentation (originating primarily from the Niobrara River and Bazile Creek) and Mainstem System releases would continue and interim roadway improvements implemented in 1995 by the Corps that are not consistent with NDOR design standards would continue under this alternative as would frequent roadway maintenance activities. Safety on N-12 in the Study Area would continue to be jeopardized by the existing roadway design deficiencies and driver hazards during flooding events. This is undesirable because there are limited transportation resources in northeastern Nebraska that allow for east-west traffic movement. N-12 provides a vital link for rural residents and east-west through traffic.

Alternative A1, Elevation Raise on Existing Alignment

Alternative A1 involves raising the existing N-12 roadway on the current alignment for both the east and west segments to an elevation approximately 9.5 feet above the projected water surface elevation of the Missouri River 50 years into the future (based from 2013) during a 100-year flood event (including compensation for potential wave action, assumed to be 3.5 feet [NDOR 2013]) (see

Figures 2-1a and 2-1b). This is approximately 14 to 15 feet higher than existing N-12. In addition, the roadway would be widened (12-foot driving lanes, 8- to 10-foot shoulders, and sloping embankments), and curvature and ingress and egress considerations for county roads and private access would be modified to satisfy current NDOR design standards and to facilitate an adequate LOS for east-west traffic. A typical cross section for Alternative A1 is shown in Figure 2-1c. The west segment is 6.2 miles long, the east segment is 6.0 miles long, and the N-14 segment is 0.7 mile long.

Traffic would be maintained on a two-lane temporary roadway through the construction zone, consisting of two 12-foot driving lanes, a 6-foot shoulder adjacent to the new roadway, and a 4-foot shoulder within the future ditch of the new roadway. Existing intersections with county roads and private crossings would remain open during construction to the greatest extent possible.

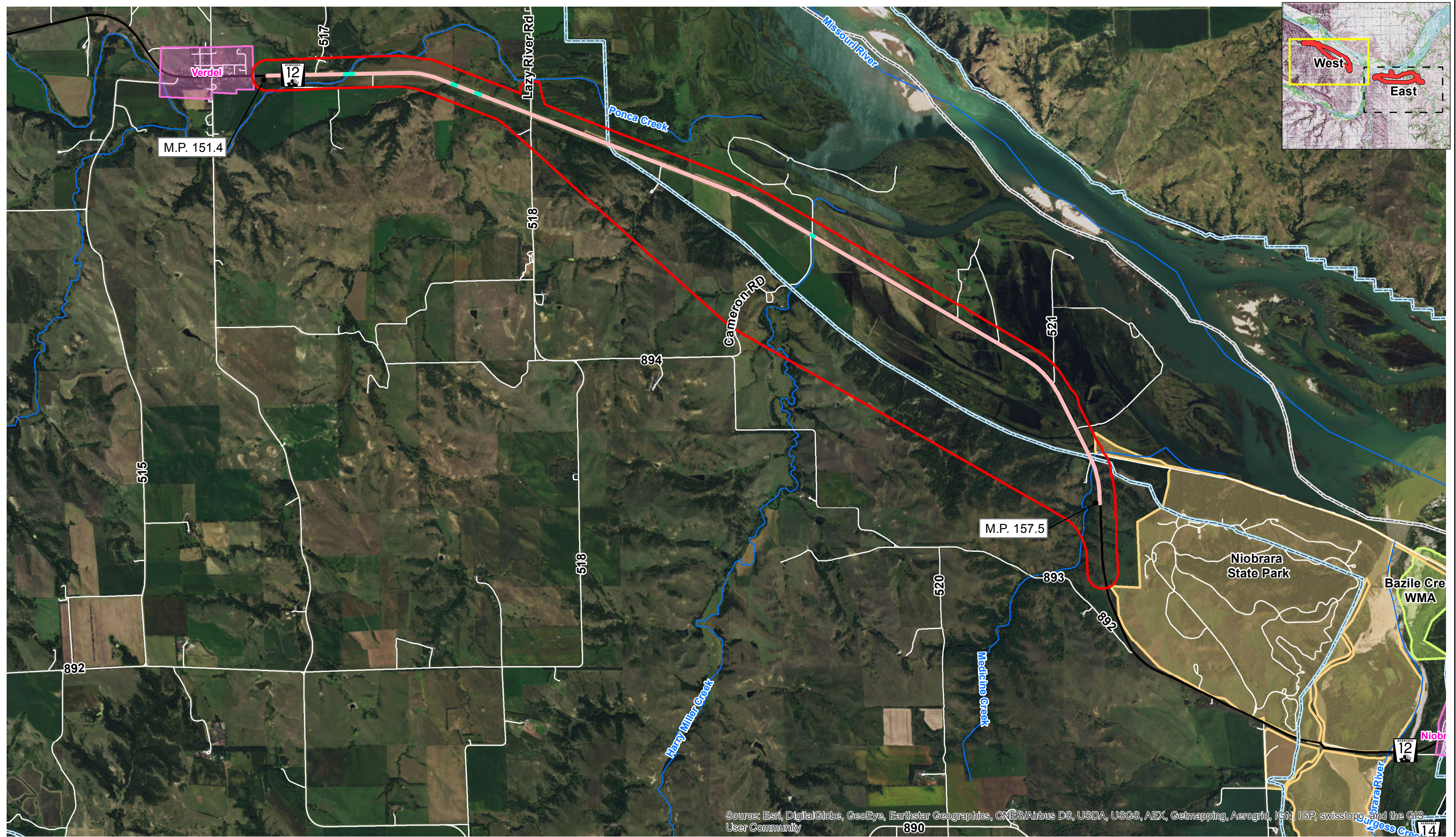
Alternative A2, Elevation Raise on Parallel Alignment

Alternative A2 involves constructing the road on a raised-elevation alignment parallel and adjacent to existing N-12 for both the east and west segment. Portions of this alternative would be constructed north of existing N-12 while other portions would be constructed south of existing N-12, dependent on site constraints and design requirements (see Figures 2-2a and 2-2b).

This alternative would be constructed at an elevation approximately 8.5 feet and 9 feet above the projected water surface elevation of the Missouri River 50 years into the future (based from 2013) during a 100-year flood event (including compensation for potential wave action, assumed to be 3.5 feet [NDOR 2013]). Roadway design would involve 12-foot driving lanes and 8- to 10-foot shoulders. The west segment is 6.2 miles long, the east segment is 6.0 miles long, and the N-14 segment is 0.9 mile long.

A wave attenuation berm that would range in length (15-foot minimum) would be incorporated on the north side of the roadway into those sections where the new highway embankment would be shifted to the south of the existing highway section. The wave attenuation berm with a vegetative wave break was designed to take advantage of the existing highway embankment where applicable (see Figure 2-2c). Where the new highway embankment would be located along (Existing Alignment) or located north of (Parallel Alignment) the existing highway, a standard 3H:1V embankment section would be used with rock riprap placed along the 3H:1V slope of the embankment (NDOR 2009b). See Figure 2-2c, for a typical section in floodplain and a typical section in areas that are not located within a floodplain. These design features satisfy current NDOR design standards and would facilitate an adequate LOS for east-west traffic.

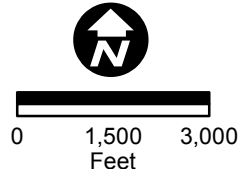
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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



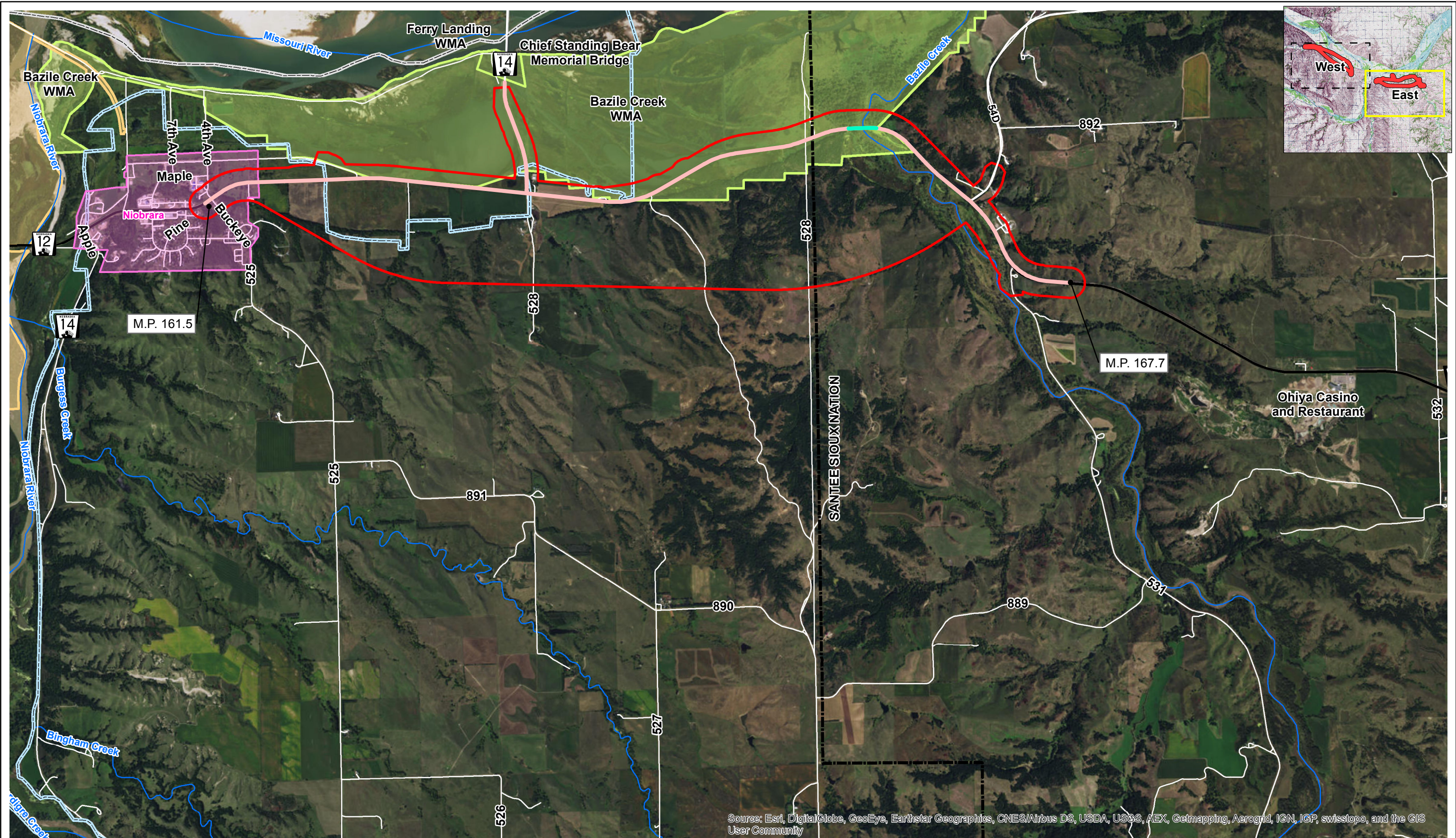
Legend			
	Alignment for Alternative A1		Recreational River Boundary
	Bridge		State Park
	Santee Sioux Nation		Wildlife Management Area
	Nebraska Highway 12		Study Area
	Waterways		City Limits
			Counties



Alternative A1
West Segment
N-12 Niobrara East and West
Knox County, Nebraska
Environmental Impact Statement



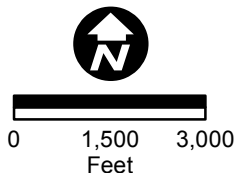
DATE	October 2015
FIGURE	2-1a



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Legend			
	Alignment for Alternative A1		Recreational River Boundary
	Bridge		State Park
	Santee Sioux Nation		City Limits
	Nebraska Highway 12		Counties
	Waterways		Wildlife Management Area
	Study Area		

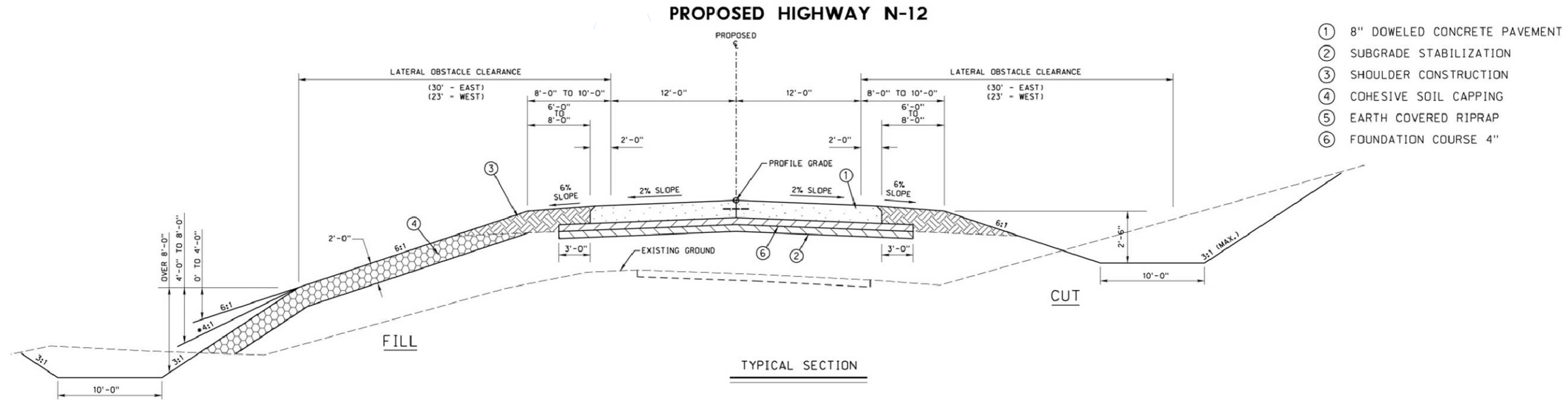
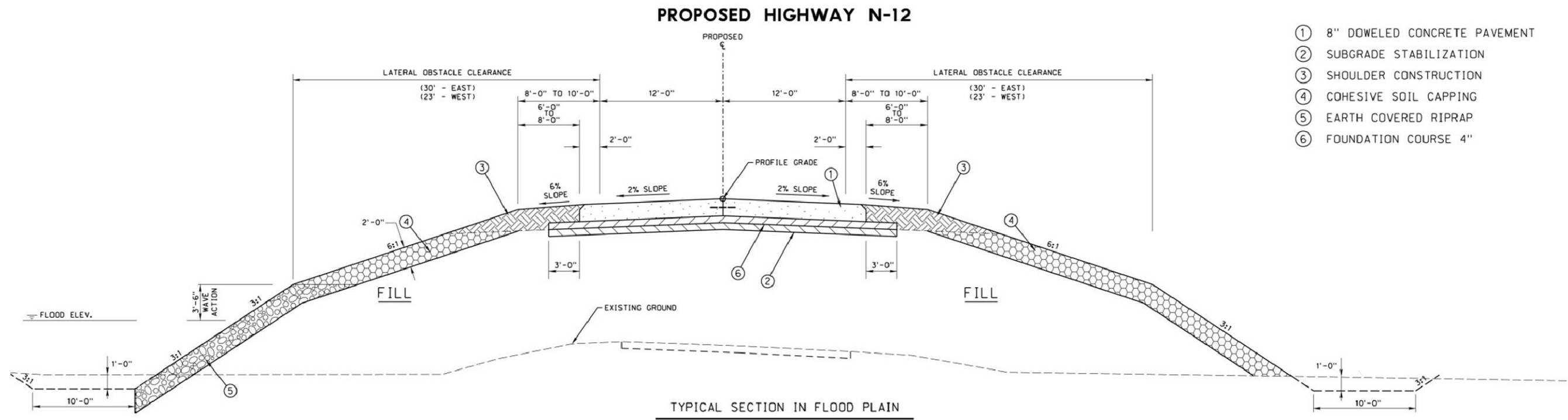


Alternative A1
East Segment
N-12 Niobrara East and West
Knox County, Nebraska
Environmental Impact Statement



DATE	October 2015
FIGURE	2-1b

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Preliminary Plan
Not Final
Subject to Change

Note: Horizontal
and Vertical Dimensions
Not to Scale

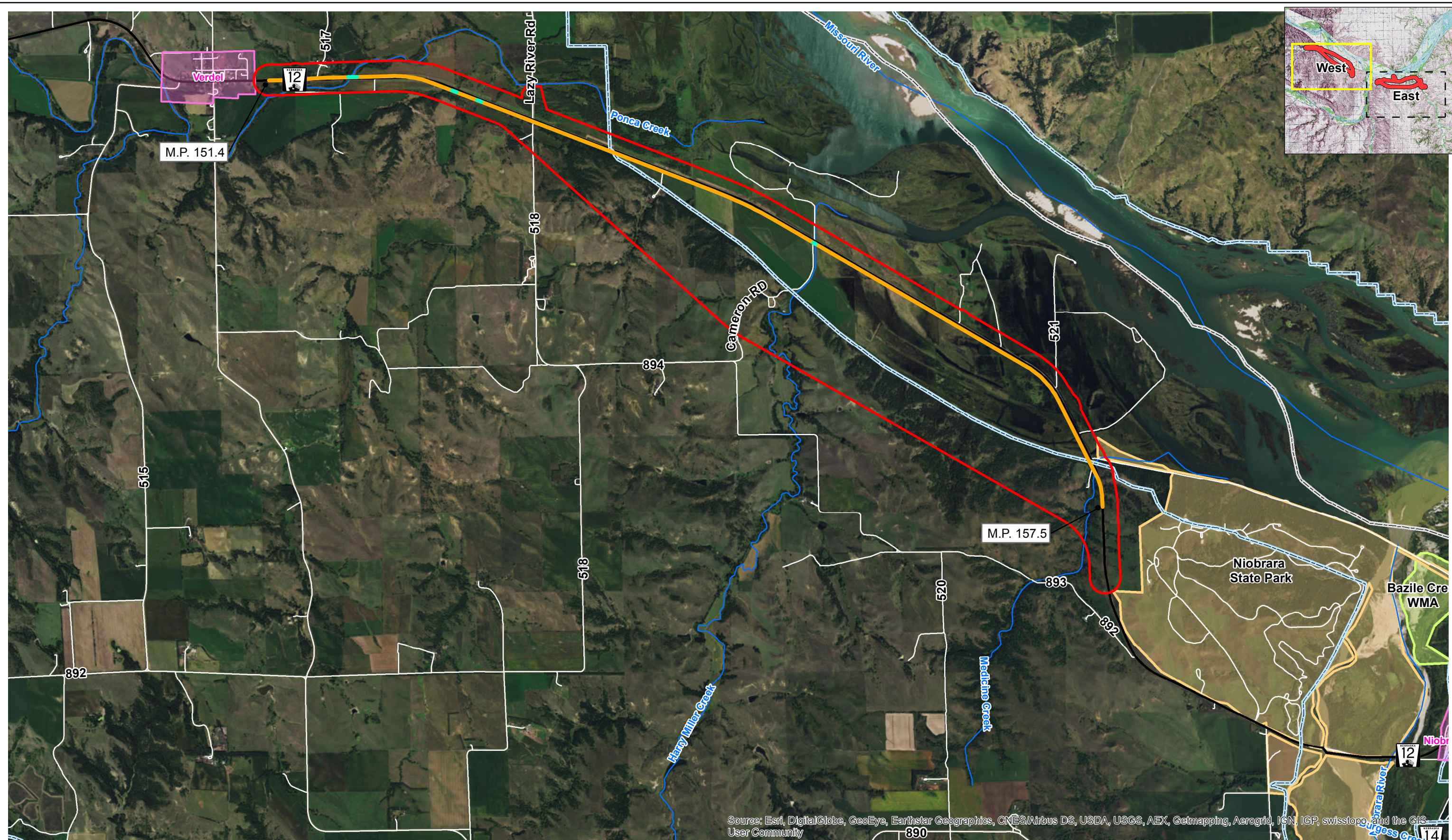
Typical Cross Section Alternative A1

N-12 Niobrara East and West
Knox County, Nebraska
Environmental Impact Statement



DATE
October 2015

FIGURE
2-1c

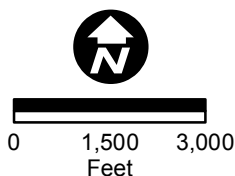


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Legend

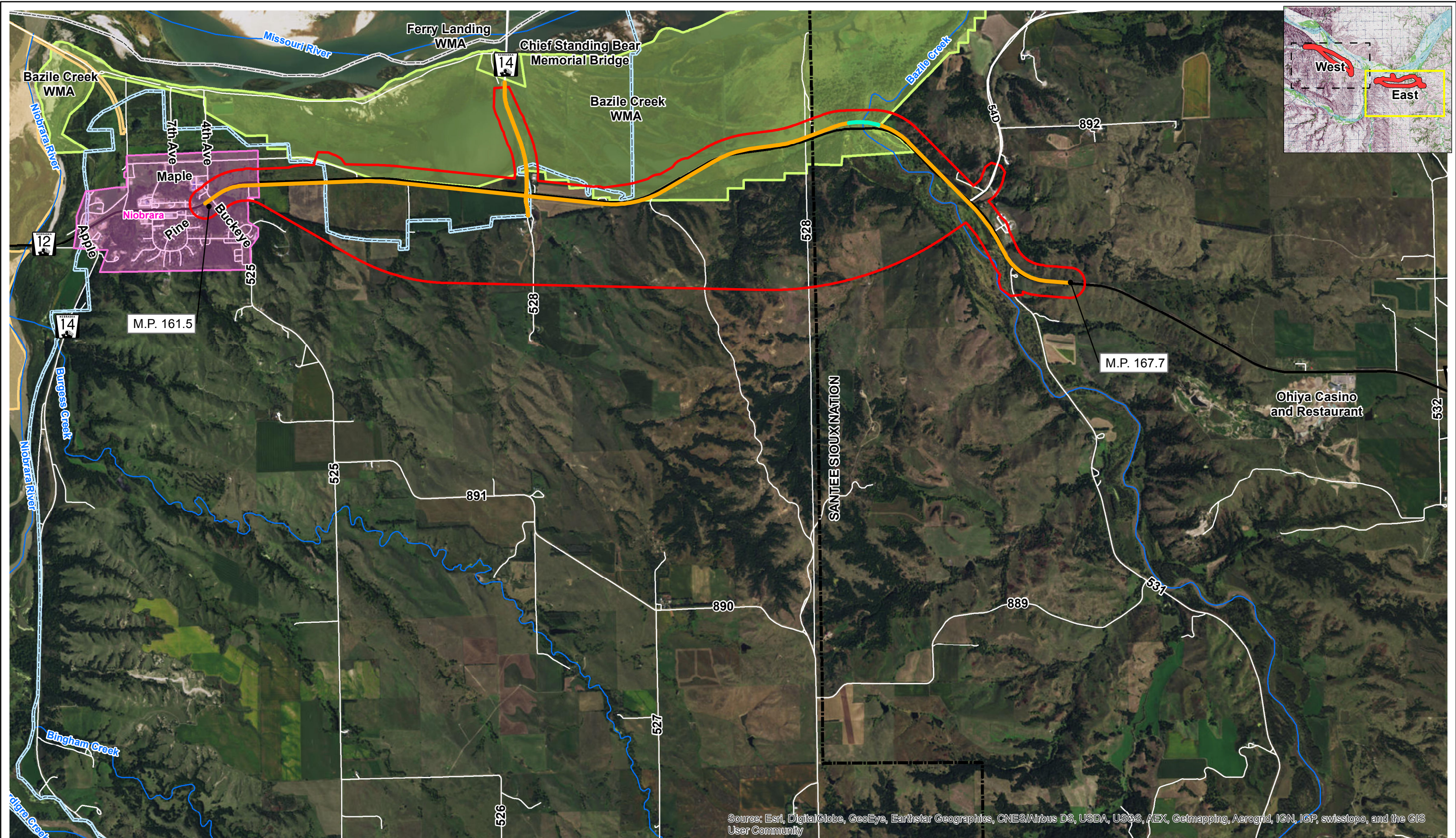
Alignment for Alternative A2	Recreational River Boundary	Study Area
Bridge	State Park	City Limits
Santee Sioux Nation	Wildlife Management Area	Counties
Nebraska Highway 12		
Waterways		



Alternative A2
West Segment
N-12 Niobrara East and West
Knox County, Nebraska
Environmental Impact Statement



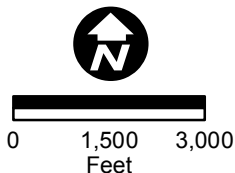
DATE	October 2015
FIGURE	2-2a



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



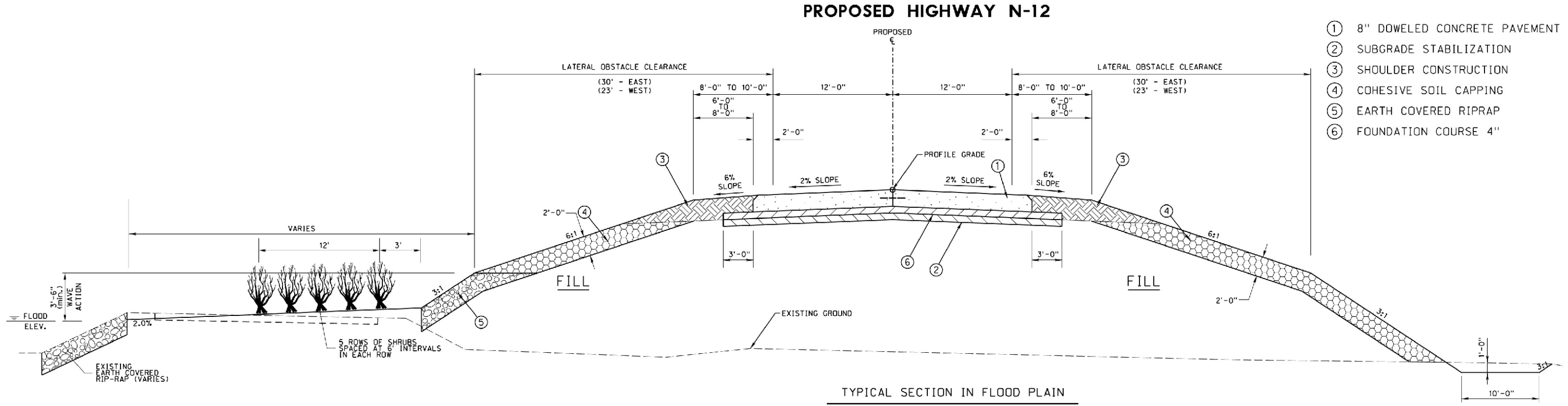
Legend			
	Alignment for Alternative A2		Recreational River Boundary
	Bridge		State Park
	Santee Sioux Nation		City Limits
	Nebraska Highway 12		Counties
	Waterways		Wildlife Management Area
	Study Area		



Alternative A2
East Segment
N-12 Niobrara East and West
Knox County, Nebraska
Environmental Impact Statement



DATE
October 2015
FIGURE
2-2b



Preliminary Plan
Not Final
Subject to Change

Note: Horizontal
and Vertical Dimensions
Not to Scale

Typical Cross Section Alternative A2

N-12 Niobrara East and West
Knox County, Nebraska
Environmental Impact Statement



DATE
October 2015

FIGURE 2-2c

The new roadway would be constructed with an offset alignment. The offset alignment, in association with a system of shoofly connections and temporary roads, would maintain traffic on both lanes of the existing roadway during construction. Existing intersections with county roads and private crossings would remain open during construction to the greatest extent possible.

What is a shoofly connection?

A shoofly connection is a temporary stretch of road that conveys traffic around construction activities.

Alternative A3, Base of Bluffs Alignment

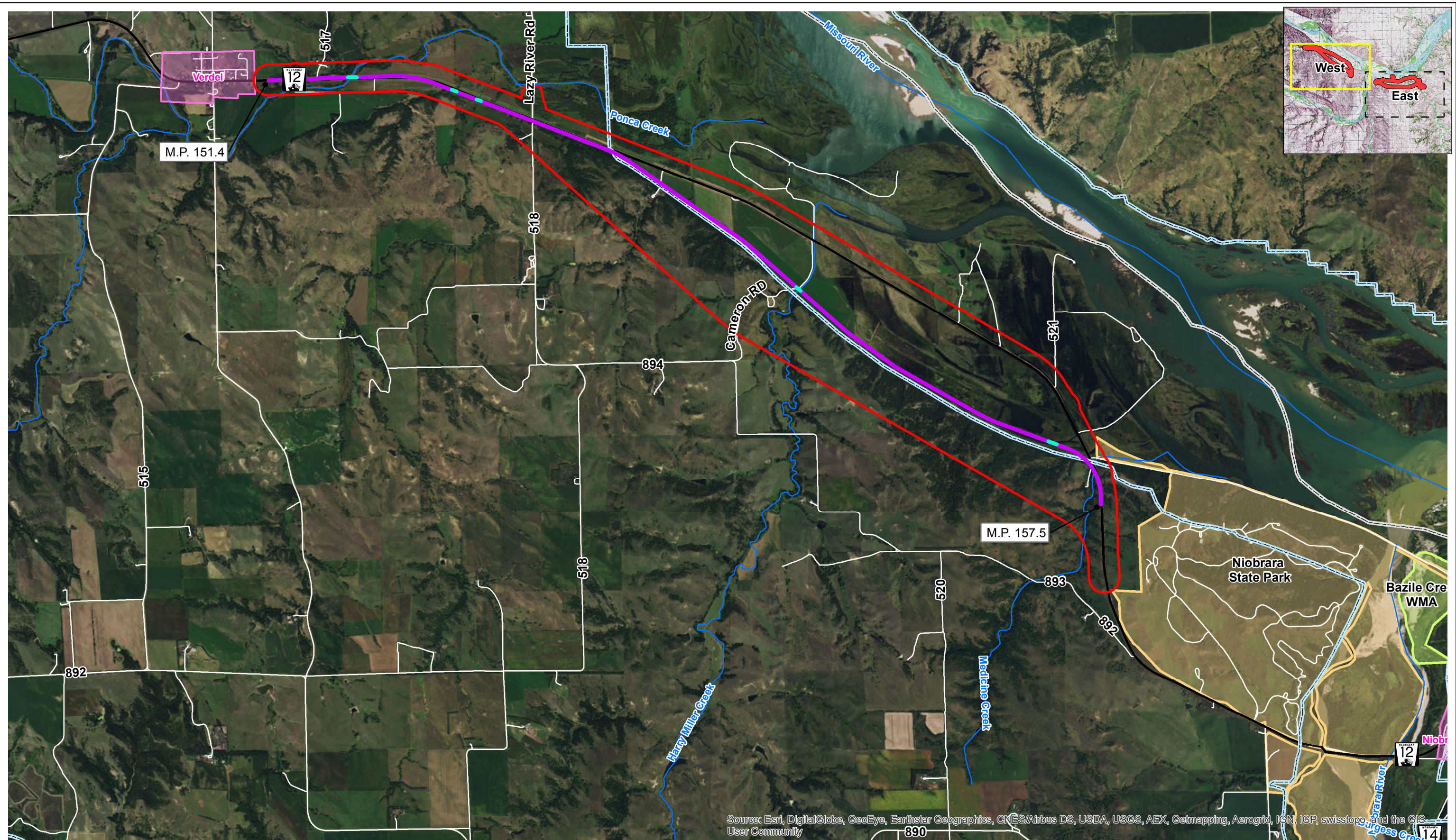
Alternative A3 would shift the roadway alignment south to the base of the Missouri River bluffs (see Figures 2-3a and 2-3b) and would be a new travel corridor. However, there are many locations where this alternative's alignment is identical to Alternative A1 or A2 due to the proximity of the bluffs to the Missouri River. In the west segment, this alternative would deviate from the existing N-12 alignment just east of Ponca Creek and would rejoin the existing alignment just north of County Road 892. In the east segment, the alignment would deviate from the existing alignment east of 4th Avenue in Niobrara and would reconnect with existing N-12 at approximately S-54D. A new connection to the Chief Standing Bear Memorial Bridge and SD-37 would be developed.

Although still in the 100-year floodplain of the Missouri River, as designated by the Federal Emergency Management Agency (FEMA), this alternative moves the alignment to the southern extreme of the floodplain where possible. A new connection to the Chief Standing Bear Memorial Bridge and SD-37 would be developed. For both segments, where the new alignment deviates from the existing N-12 alignment, the N-12 roadway would be removed to the existing ground level. Roadway removal includes all pavement and roadway embankment.

This alternative would be constructed at an elevation approximately 9 feet and 11.5 feet above the projected water surface elevation of the Missouri River 50 years into the future (based from 2013) during a 100-year flood event (including compensation for potential wave action, assumed to be 3.5 feet [NDOR 2013]). Roadway design would involve 12-foot driving lanes and 8- to 10-foot shoulders. Construction of a road at the Alternative A3 location would include total elimination of the entire existing N-12 roadway embankment; therefore, no wave attenuation berm would be incorporated. Segments of this alternative within the floodplain would use a standard 3H:1V embankment section with rock riprap placed along the 3H:1V slope of the embankment (NDOR 2009b). Typical cross sections for Alternative A3 (not within a floodplain and within the floodplain) are shown in Figure 2-3c. These design features satisfy current NDOR design standards and would facilitate an adequate LOS for east-west traffic.

The new roadway would be constructed on a predominantly new alignment. The new alignment, in association with a system of shoofly connections and temporary roads, would maintain traffic on both lanes of the existing roadway during construction. Existing intersections with county roads and private crossings would remain open during construction to the greatest extent possible. The west segment is 6.1 miles long, the east segment is 6.0 miles long, and the N-14 segment is 0.9 mile long.

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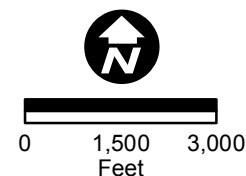


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Legend

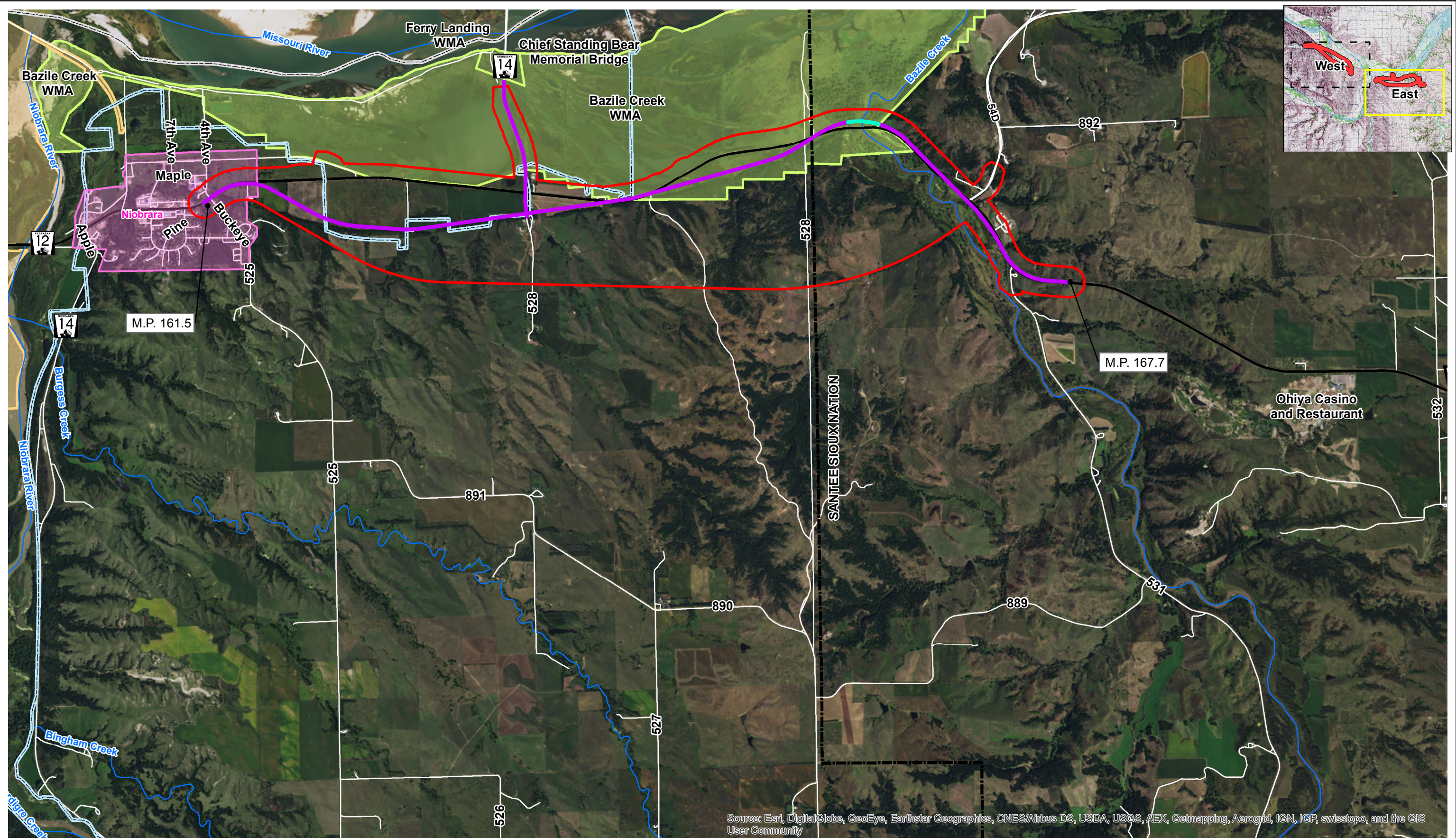
Alignment for Alternative A3	Recreational River Boundary	Study Area
Bridge	State Park	City Limits
Santee Sioux Nation	Wildlife Management Area	Counties
Nebraska Highway 12		
Waterways		



Alternative A3
West Segment
N-12 Niobrara East and West
Knox County, Nebraska
Environmental Impact Statement



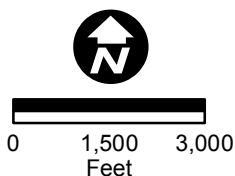
DATE	October 2015
FIGURE	2-3a



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Legend		
Alignment for Alternative A3	Recreational River Boundary	Study Area
Bridge	State Park	City Limits
Santee Sioux Nation	Wildlife Management Area	Counties
Nebraska Highway 12		
Waterways		



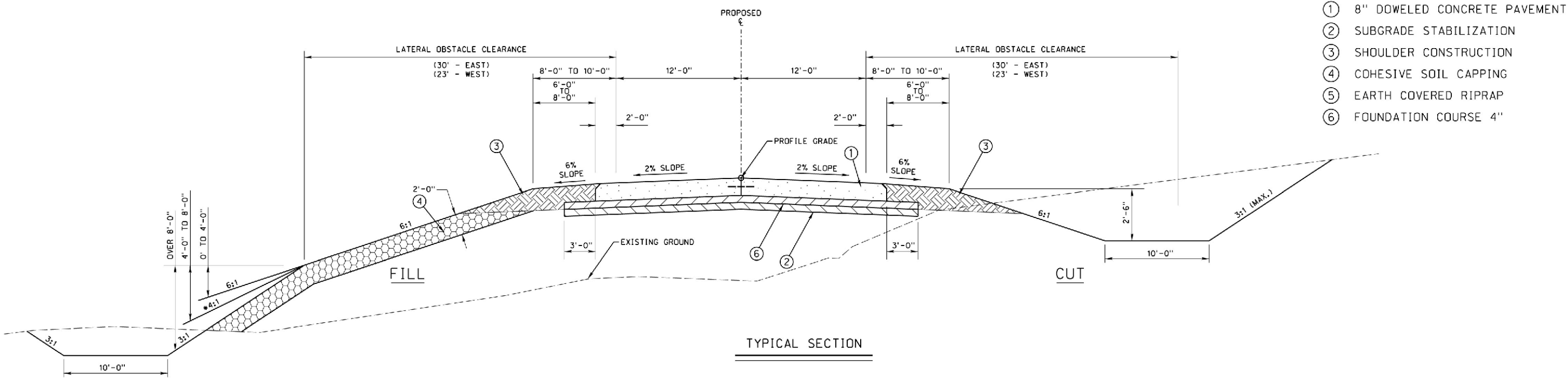
Alternative A3
East Segment
N-12 Niobrara East and West
Knox County, Nebraska
Environmental Impact Statement



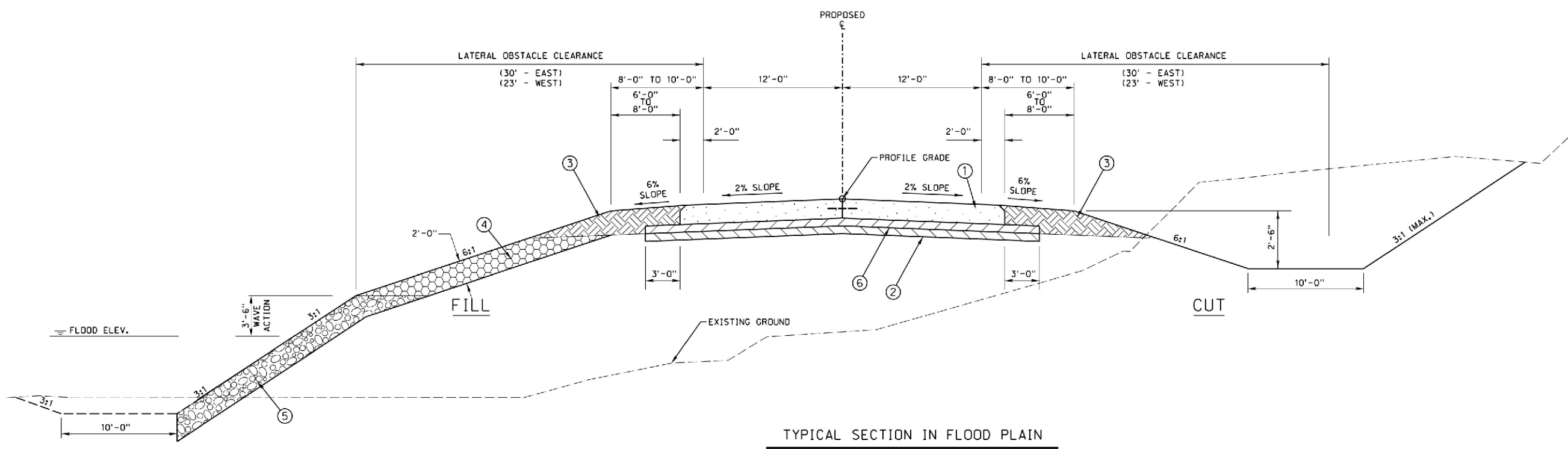
DATE	October 2015
FIGURE	2-3b

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PROPOSED HIGHWAY N-12



PROPOSED HIGHWAY N-12



Note: Horizontal
and Vertical Dimensions
Not to Scale

Preliminary Plan
Not Final
Subject to Change

Typical Cross Section
Alternative A3

N-12 Niobrara East and West
Knox County, Nebraska
Environmental Impact Statement



DATE
October 2015

FIGURE
2-3c

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Alternative B1, Bluffs Alignment

Alternative B1 would relocate N-12 south of the Missouri River floodplain along the adjacent bluffs and would be an entirely new transportation corridor (see Figures 2-4a and 2-4b). On the west end of the west segment, this alternative would deviate from the existing alignment just east of Ponca Creek and would rejoin the existing alignment just north of County Road 892. In the east segment, the alignment would deviate from the existing alignment east of 4th Avenue in Niobrara and would reconnect with existing N-12 at approximately S-54D. A new connection to the Chief Standing Bear Memorial Bridge and SD-37 would be developed. The west segment is 6.4 miles long, the east segment is 5.9 miles long, and the N-14 segment is 1.2 miles long.

Most of this alignment is outside of the FEMA-designated 100-year floodplain of the Missouri River, current and future flood hazards would be eliminated. For areas utilizing the Alternative A2 alignment, the Alternative A2 design elevations and design criteria would be applied (see Figure 2-2c).

Modifications to standard roadway templates would be required to minimize the landslide potential associated with constructing on the Pierre Shale geologic formation (discussed under Concept B in Section 2.2.1, General Concepts). See Section 2.5.3, Cost Screening Results, Alternative Refinements for Cost Estimates, Bluffs Alternatives Refinement, for details on measures included to mitigate for construction in Pierre Shale. See Figure 2-4c for typical fill and cut sections for Alternative B1. These design features satisfy current NDOR design standards and would facilitate an adequate LOS for east-west traffic.

During construction, traffic would be maintained on the existing highway. Construction of Alternative B1 would include total elimination of the entire existing N-12 roadway embankment within the Study Area following construction. Additional access to private properties would be considered on a case-by-case basis. If access could not be reasonably provided, the private parcel would be purchased.

Alternative B2, South of Bluffs Alignment

This alignment is located primarily south of Alternative B1 and would use portions of existing county road alignments and ROW (see Figures 2-5a and 2-5b). In the west segment, this alternative would deviate from existing N-12 in the vicinity of Lazy River Road and would reconnect with existing N-12 at its intersection with County Road 892, west of Niobrara. In the east segment, either the Alternative B1 alignment or one of the Concept A alignments, depending on alternatives screening and environmental analysis, would be constructed from Niobrara to the N-14 intersection. At this point, the new alignment would proceed south before continuing east in the low areas south of the bluffs. Ultimately, the new alignment would reconnect with existing N-12 just east of County Road 531. An additional connection with existing N-12 would be made on the eastern side of the east segment in order to maintain access to S-54D. The west segment is 6.2 miles long and the east segment is 9.7 miles long.

With the exception of the connection point from Verdel to Lazy River Road, the west segment is outside of the FEMA-designated 100-year floodplain of the Missouri River. For areas utilizing the Alternative A2 alignment, the Alternative A2 design elevations and design criteria (see Figure 2-2c) would be applied.

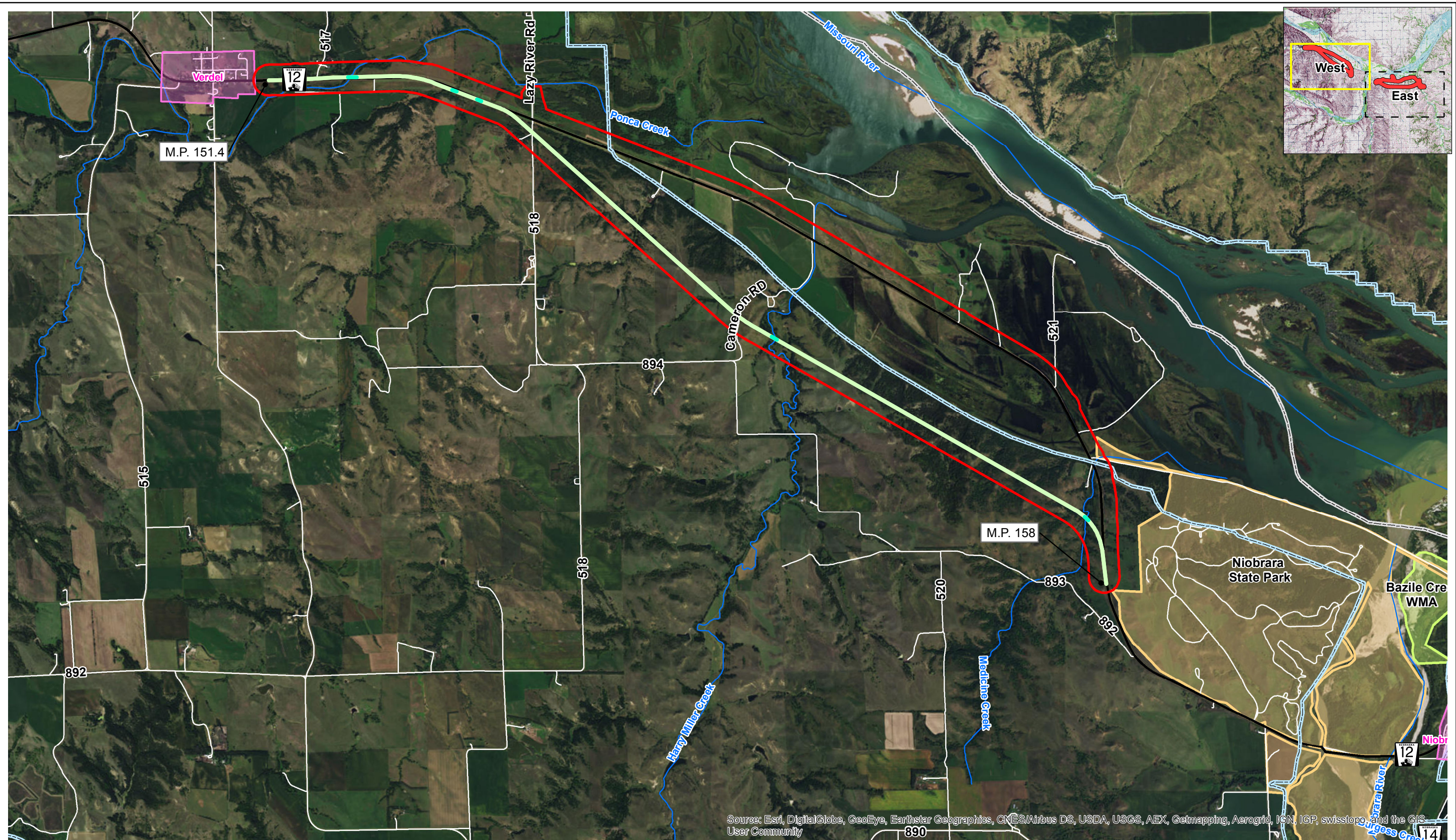
In the east segment, if one of the Concept A alignments is used to connect to N-14 from Niobrara, the portion of this alignment that is in the floodplain would be constructed at an elevation approximately 8 to 9 feet above the water surface elevation of the Missouri River during the 100-year flood event.

Refer to typical cross section details for Alternative A1, Alternative A2, and Alternative A3 (Figures 2-1c, 2-2c, and 2-3c, respectively). If the Alternative A2 alignment was implemented, a wave attenuation berm would be incorporated in those areas where the Alternative B2 alignment highway embankment would be shifted to the south of the existing highway section.

As with Alternative B1, modifications to standard roadway templates would be required to minimize the landslide potential associated with constructing on the Pierre Shale geologic formation (see Figure 2-4c).

These design features satisfy current NDOR design standards and would facilitate an adequate LOS for east-west traffic

During construction, traffic would be maintained on the existing highway. Construction of Alternative B2 would include total elimination of the entire existing N-12 roadway embankment within the Study Area following construction (except if utilized as a wave berm in the east segment from Niobrara to the N-14 intersection). Additional access to private properties would be considered on a case-by-case basis. If access could not be reasonably provided, the private parcel would be purchased.

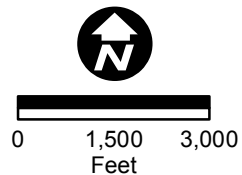


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Legend

- | | | |
|------------------------------|-----------------------------|-------------|
| Alignment for Alternative B1 | Recreational River Boundary | Study Area |
| Bridge | State Park | City Limits |
| Santee Sioux Nation | Wildlife Management Area | Counties |
| Nebraska Highway 12 | | |
| Waterways | | |

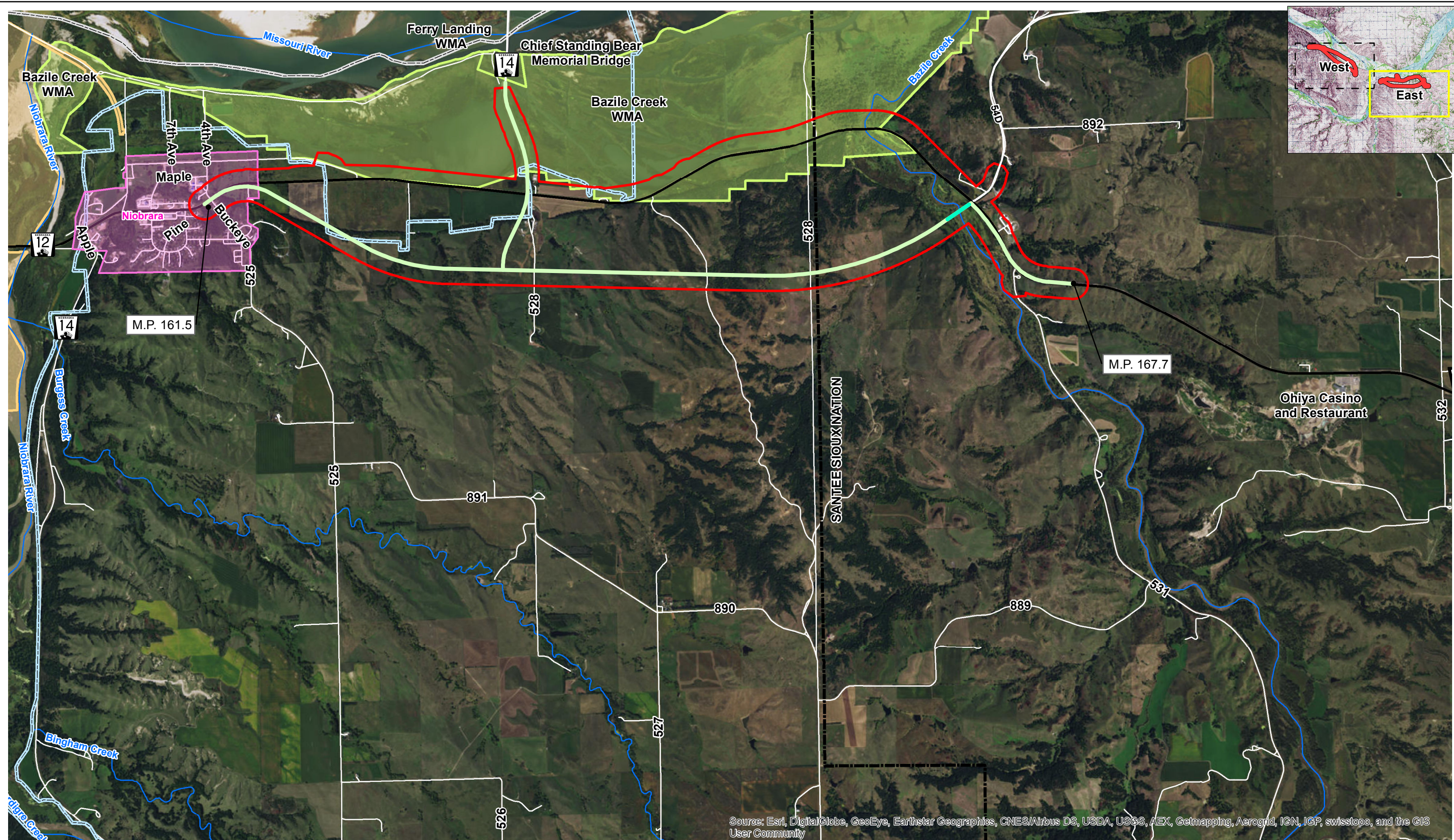


Alternative B1
West Segment
N-12 Niobrara East and West
Knox County, Nebraska
Environmental Impact Statement

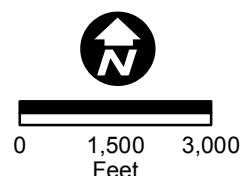
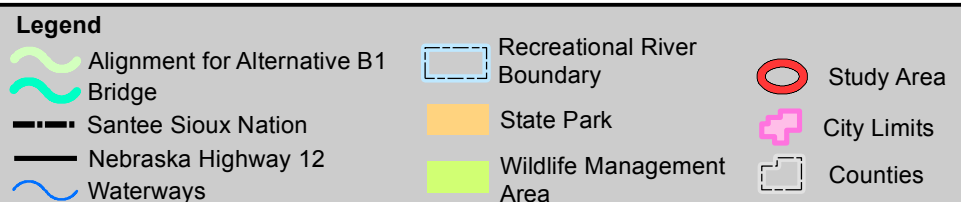


DATE
October 2015

FIGURE
2-4a



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Alternative B1
East Segment
N-12 Niobrara East and West
Knox County, Nebraska
Environmental Impact Statement

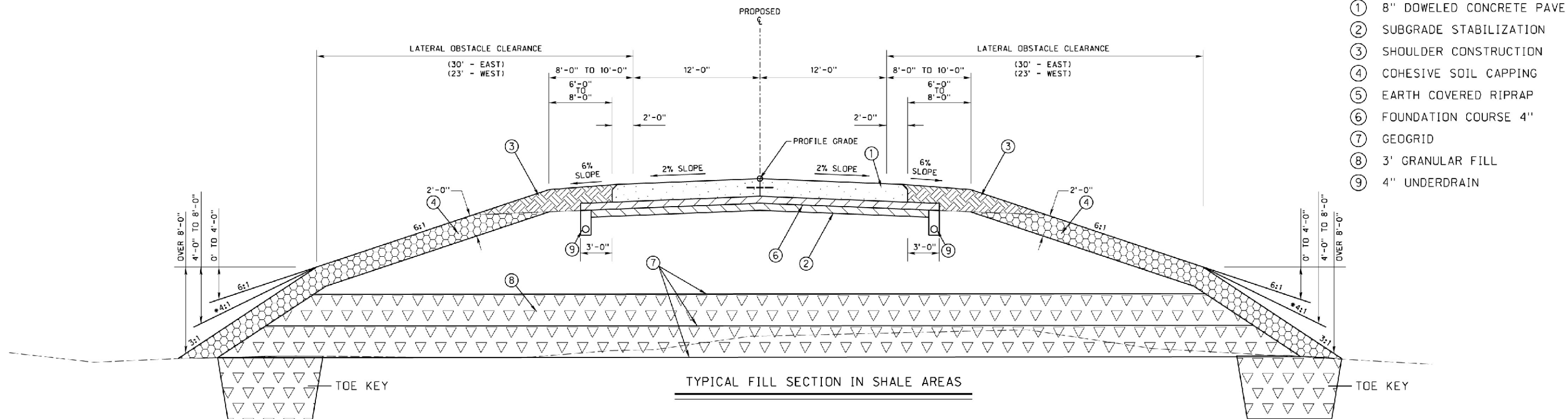


DATE
October 2015

FIGURE
2-4b

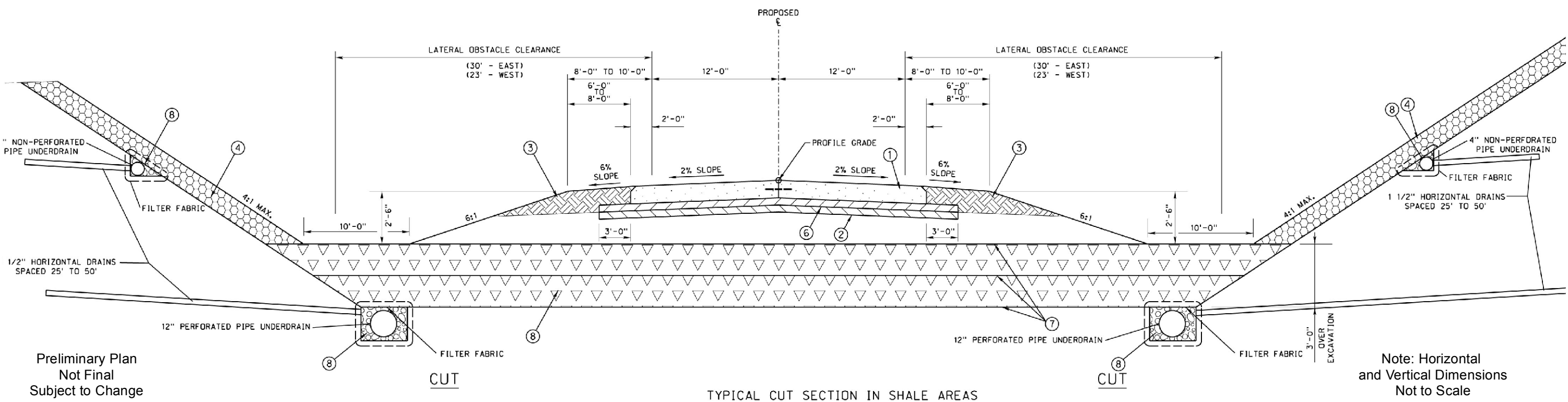
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PROPOSED HIGHWAY N-12



NOTE: IF THE PROPOSED GRADE DOES NOT ALLOW THE PLACEMENT OF THE 3' OF GRANULAR MATERIAL, OVER-EXCAVATION WILL BE REQUIRED TO OBTAIN THE REQUIRED DEPTH.

PROPOSED HIGHWAY N-12



Note: Horizontal and Vertical Dimensions Not to Scale

Typical Cross Section
Alternative B1

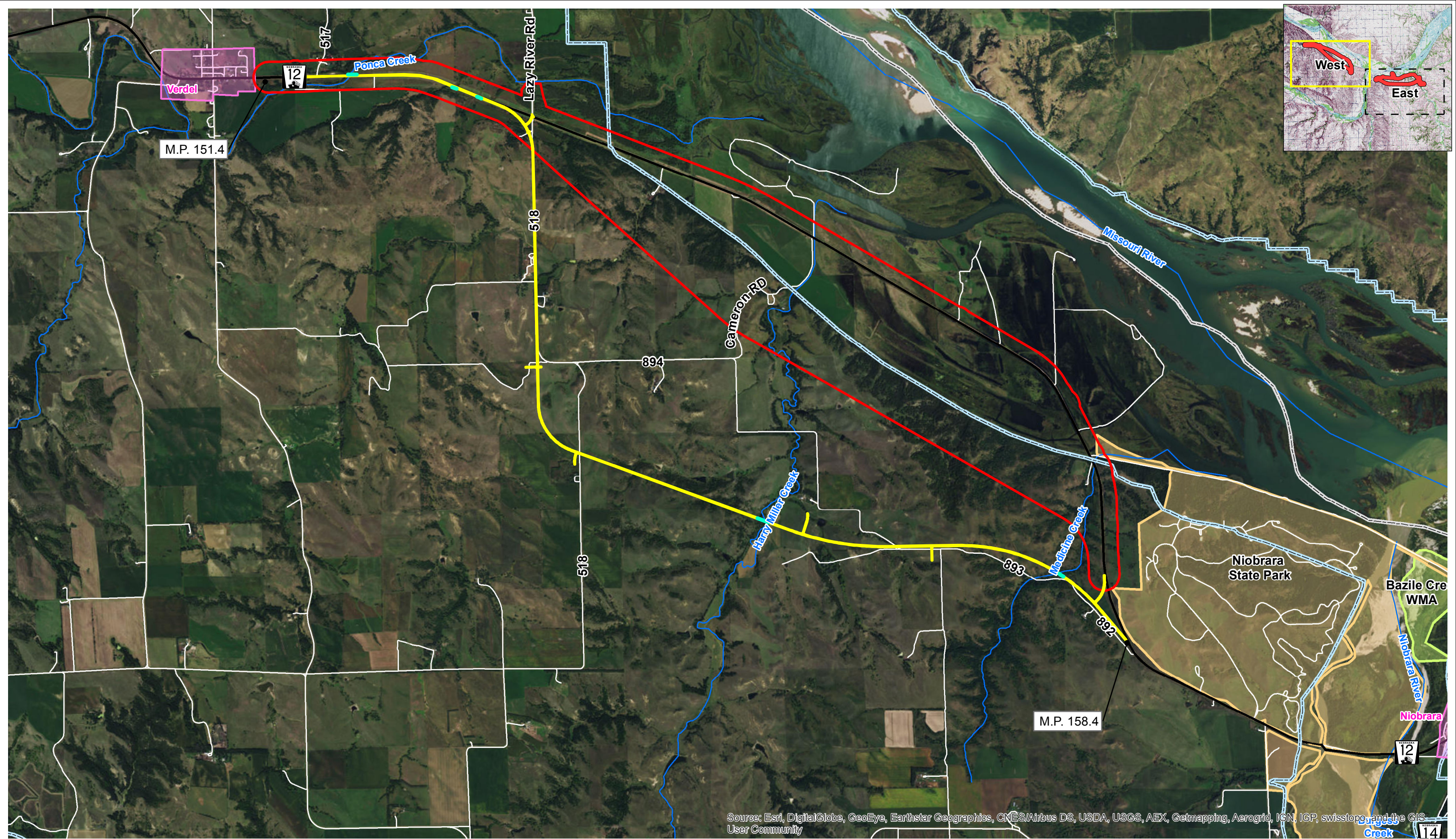
N-12 Niobrara East and West
Knox County, Nebraska
Environmental Impact Statement



DATE
October 2015

FIGURE
2-4c

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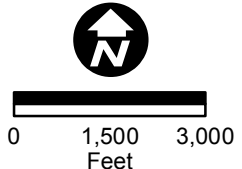


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Legend

Alignment for Alternative B2	Recreational River Boundary	Study Area
Bridge	State Park	City Limits
Santee Sioux Nation	Wildlife Management Area	Counties
Nebraska Highway 12		
Waterways		

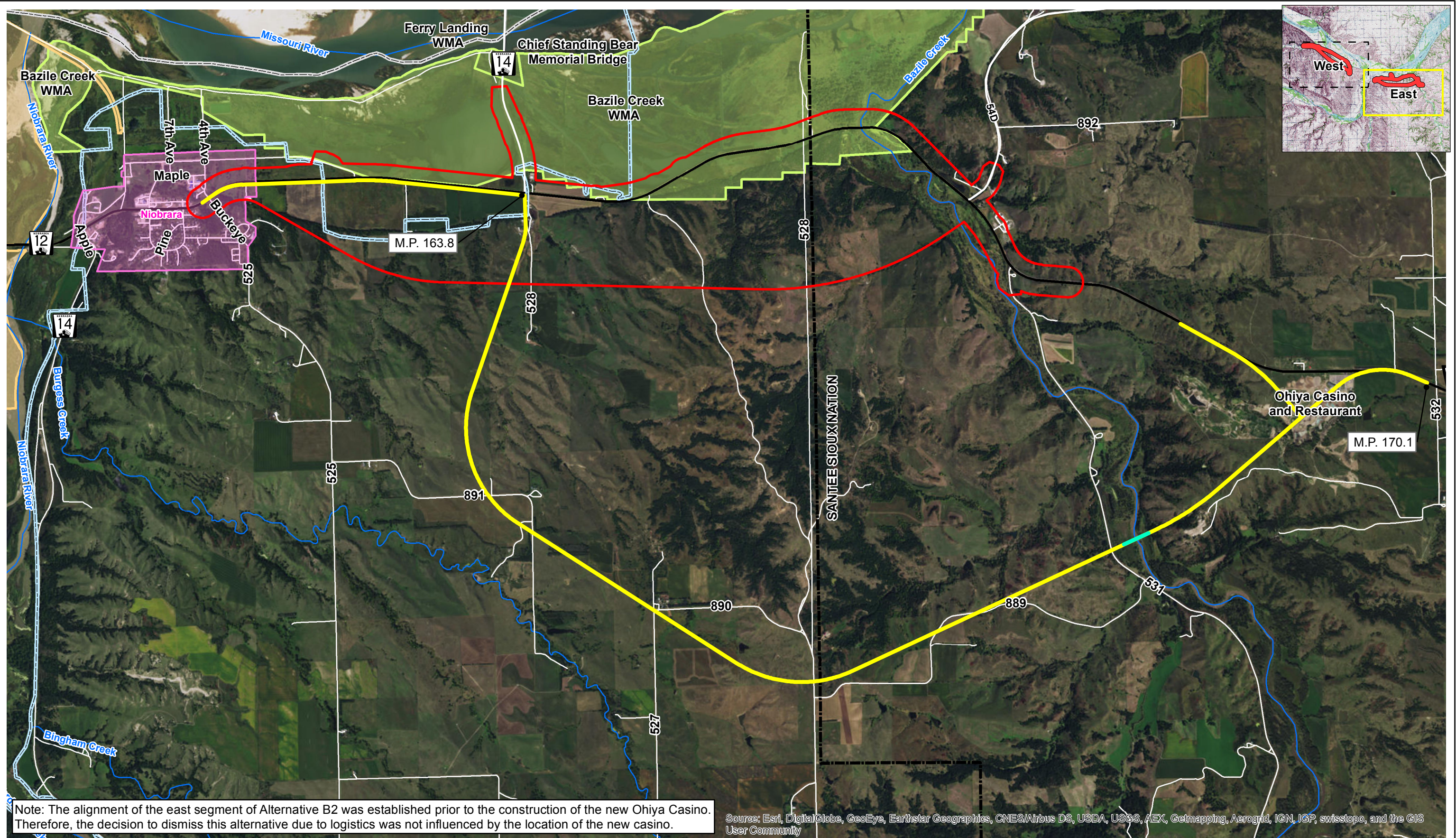


Alternative B2
West Segment
N-12 Niobrara East and West
Knox County, Nebraska
Environmental Impact Statement



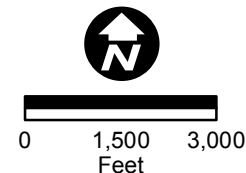
DATE	October 2015
FIGURE	2-5a

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Legend

- | | | |
|------------------------------|-----------------------------|-------------|
| Alignment for Alternative B2 | Recreational River Boundary | Study Area |
| Bridge | State Park | City Limits |
| Santee Sioux Nation | Wildlife Management Area | Counties |
| Nebraska Highway 12 | | |
| Waterways | | |



Alternative B2
East Segment
N-12 Niobrara East and West
Knox County, Nebraska
Environmental Impact Statement



DATE
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FIGURE
2-5b

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2.3 ALTERNATIVE SCREENING PROCESS

To determine which alternatives have the potential of meeting the project purpose and need and could practicably be constructed, and therefore would be carried forward in the EIS, the Corps uses a multiphased screening process. This process is based on the Section 404(b)(1) guidelines and is outlined in Figure 2-6 (40 CFR 230.10(a)(2)). Detailed methods and results of the alternative screening are provided in the sections to follow.

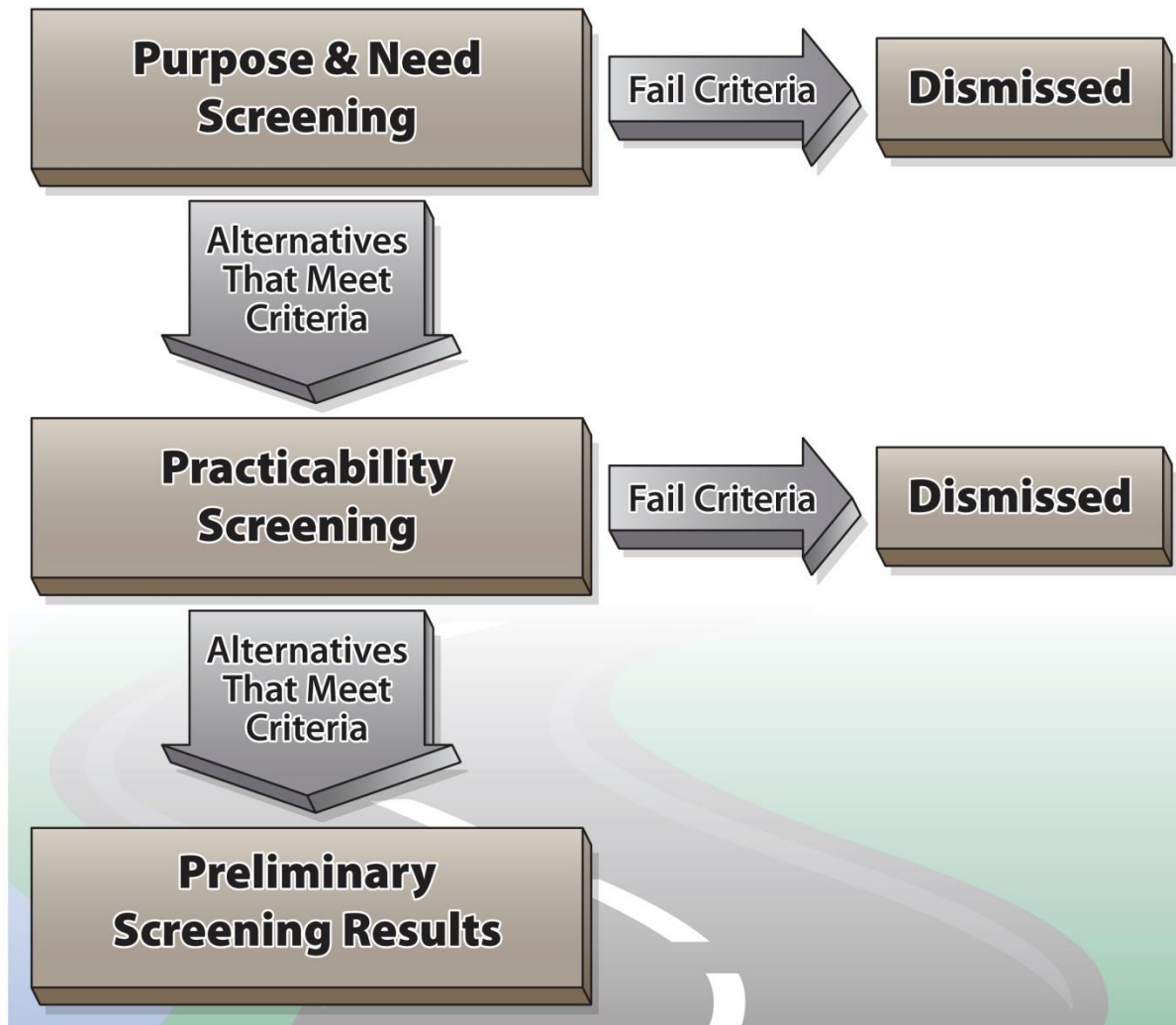


Figure 2-6 Screening Process

2.4 SCREENING OF ALTERNATIVES ON PURPOSE AND NEED

The Corps coordinated with NDOR to evaluate the full range of alternatives for their ability to provide a reliable roadway that safely accommodates traffic and maintains regional connectivity. The Corps then developed screening criteria to ensure that project alternatives facilitate the project's purpose and need. It was determined that an alternative could reasonably be eliminated from detailed consideration in the EIS if it fails to satisfy one or more of the purpose and need screening criteria, described below.

2.4.1 Purpose and Need Screening Criteria

To ensure that alternatives satisfy the overall project's purpose of providing a reliable transportation link on N-12 between Verdel and S-54D that eliminates existing roadway deficiencies caused by operations of the Lake and that safely accommodates current and projected traffic levels while maintaining regional connectivity, the Corps evaluated each alternative against the following criteria:

- Provides a reliable roadway
 - Reduces or eliminates road closures due to flooding
 - Reduces or eliminates maintenance needs due to flooding
- Safely accommodates traffic
 - Meets NDOR design standards
 - Reduces or eliminates driver hazards during flooding
- Maintains regional connectivity
 - Provides a link for the traveling public using N-14 and the county road system, and for accessing Niobrara

2.4.2 Purpose and Need Screening Results

Purpose and need screening determined that all of the alternatives—Alternatives A1, A2, A3, B1, and B2—would meet the basic and overall purpose and need and would proceed to the next phase of the screening process.

2.5 SCREENING OF ALTERNATIVES ON PRACTICABILITY

All five Action Alternatives—Alternatives A1, A2, A3, B1, and B2—were determined to be capable of satisfying the purpose and need were carried forward and analyzed for practicability.

2.5.1 Practicability Screening Criteria

Alternatives that can be attained or reasonably managed are considered practicable. According to the Section 404(b)(1) guidelines, "Practicable alternatives include, but are not limited to (i) Activities which do not involve a discharge of dredged or fill material into the waters of the United States...; (ii) Discharges of dredged or fill material at other locations in waters of the United States" (40 CFR 230.10(a)(1)). In addition, "An alternative is practicable if it is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of the overall project purpose" (40 CFR 230.10(a)(2)).

While the Corps identified logistic and cost considerations, there are no applicable technology considerations related to the project. All technology considerations related to the project, such as construction in Pierre Shale, can be addressed with additional engineering considerations and design

modifications. These additional considerations may affect the logistical constraints of an alternative and/or the cost of the alternative.

Therefore, in order to ensure that alternatives are practicable, the Corps evaluated each alternative against the following criteria:

- Logistics Considerations
 - Use of tribal land
 - Section 7(a) Evaluation, Wild and Scenic Rivers Act
- Cost Considerations
 - Preliminary engineering
 - Roadway and grading
 - ROW acquisition and parcel access
 - Utilities
 - Construction engineering
 - Total cost estimate (in 2014 U.S. dollars)

What is included in the total cost estimate?

The total cost estimate for each alternative includes preliminary engineering, roadway and grading (culverts, seeding, bridge, guardrail, surfacing, and general items), ROW acquisition and parcel access, utility relocation, and construction engineering.

2.5.2 Logistics Screening Results

For purposes of the project, logistics screening criteria (as listed above) were determined to be those project components that have the potential of being excessively or significantly difficult to accommodate or are beyond NDOR's control. Further, if adequate accommodations could not be made for these project components, successful project implementation would not occur and the specific alternative would be considered not practicable and therefore not carried forward for further consideration.

Use of Tribal Land

Acquisition of ROW easements on tribal lands can be a lengthy process. In cases where tribal support is favorable, this process can take more than 1 year to accomplish. Furthermore, neither the federal government nor the state of Nebraska has the power of eminent domain on tribal land. Only the east segment of Alternative B2 would require ROW easement from tribal lands or allotment lands held by tribal members of the Santee Sioux Tribe. The Ponca Tribe of Nebraska historically lived in and around the Study Area, but do not hold reservation lands. The Ponca Tribe of Nebraska's interest is the historic and cultural properties and artifacts that may exist in the Study Area (see Section 3.8, Cultural Resources).

What is eminent domain?

Eminent domain is the power of the federal or state government to take private property for a public purpose, even if the property owner objects. The Fifth Amendment to the United States Constitution allows the government to take private property if the taking is for a public use and the owner is "justly compensated" (usually, paid fair market value) for his or her loss. A public use is virtually anything that is sanctioned by a federal or state legislative body. Such uses may include roads, parks, reservoirs, schools, hospitals, or other public buildings.

At the agency scoping meeting held on August 28, 2008, both the Ponca Tribe of Nebraska and the Santee Sioux Tribe stated that they would support an alternative on or near the existing alignment but would not support an alternative in the bluffs (HDR 2008). The Ponca Tribe of Nebraska has plans that call for the roadway to stay on its existing alignment while the Santee Sioux Tribe have property that contains commercial space and a public campground on N-12 near the N-12 intersection with S-54D. In addition, a primary access to the village of Santee, Nebraska, is from N-12 on S-54D. Tribal support of an alternative may be crucial

to acquiring ROW easements. Tribes may exert influence on privately held land that is within reservation boundaries. Tribal input is crucial for Section 401 water quality certification on tribal lands and for the Section 106 approval process. Due to the lack of support for an alternative that is on a bluffs alignment, the likelihood of acquisition of ROW easements on tribal lands would be excessively problematic and significantly more difficult than acquiring ROW easements on non-tribal lands or where tribal support is favorable.

Alternative routes for the east segment of Alternative B2 were considered. The east segment of Alternative B2 would have to be relocated outside of the Study Area for the project to avoid any existing tribal land. This adjustment would further separate N-12 from tribal property along existing N-12 near S-54D and from S-54D itself. Santee Sioux Tribe of Nebraska indicated that they would not be in support of alternatives that would separate N-12 from their properties on existing N-12 and the connection to S-54D. It was determined that the east segment of Alternative B2 cannot avoid tribal lands and therefore is not practicable from a logistics perspective due to the inability to acquire tribal land in a timely manner or at all.

Alternative B1 was modified during its development so that the east end of the east segment joins existing N-12 west of or at the intersection of N-12 and S-54D. This realignment minimizes use of tribal land and maintains traffic past the S-54D and Santee Sioux Tribe property adjacent to that intersection. The east segment of Alternative B2 could not be reasonably modified so that use of tribal land could be minimized.

The west segment of Alternative B2 is not within tribal lands, therefore, the logistics of ROW acquisition for the east segment does not exist for the west segment. The west segment of Alternative B2 meets both the purpose and need and practicability screening criteria. Both Alternatives B1 and B2 are considered by the Corps to be avoidance alternatives. A review of impacts on aquatic habitat indicates that Alternative B2 has more impacts on wetlands than Alternative B1. Both of these alternatives are in the bluffs of the Missouri River and are therefore both new alignments in similar geographic settings. There was no information provided from agencies, Native American tribes, or the general public that revealed advantages or disadvantages of either Alternative B1 or B2 (the west segment) from a public interest perspective. Because Alternative B2 has no distinct advantages or distinguishing features from those of Alternative B1, the east segment not being logistically practicable, and as an avoidance alternative, has more impacts on aquatic habitat than Alternative B1, it was determined that Alternative B2 is redundant and that it is not necessary to carry Alternative B2 forward in the EIS for detailed environmental evaluation.

What is an avoidance alternative?

An avoidance alternative is an alternative that avoids impacts to the aquatic habitat (wetlands and other waters of the U.S.).

Therefore, Alternative B2 is eliminated from detailed analysis in the EIS.

Section 7(a) Evaluation, Wild and Scenic Rivers Act

The Wild and Scenic Rivers Act provides standards of evaluation to protect a designated river from the harmful effects of federally assisted water resources projects (including roadway construction projects). During the Section 7(a) Evaluation, NPS would evaluate the impacts of the project on the outstandingly remarkable values (ORVs) for which the MNRR was established by Congress and would provide a determination. This determination would be based on an evaluation of the potential impacts on the ORVs by the NDOR's Applied-for Project relative to the existing conditions. This evaluation must consider the viewshed both to and from the MNRR. NPS, which has the final authority relative to compliance with Section 7(a) of the Wild and Scenic Rivers Act, has not

indicated that any one alternative is not possible based on compliance with Section 7(a). Information to be used for the Section 7(a) Evaluation is provided in Appendix A.

Logistics Screening Summary

Based on the logistics considerations discussed above, the east segment of Alternative B2 can be dismissed from further evaluation in the EIS because it is not practicable from a logistics perspective and the west segment is a redundant alternative to the west segment of Alternative B1 with no distinct advantages and more impacts on aquatic habitat. Table 2-1 summarizes these findings. Alternatives A1, A2, A3, and B1 are practicable under logistics criteria and therefore would be reviewed for practicability under cost criteria in Section 2.5.3, Cost Screening Results.

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Table 2-1
Screening of Alternatives on Practicability – Logistics

Logistics Screening Criteria	A1 – Existing Alignment	A2 – Parallel Alignment	A3 – Base of Bluffs Alignment	B1 – Bluffs Alignment	B-2 – South of Bluffs Alignment
Use of tribal land	These alternatives do not require easements for new ROW from tribes. Tribes have indicated support for alternatives in the floodplain.				Acquisition of ROW in the east segment is outside of NDOR's control and is uncertain due to tribal preferences.
Use of Corps land	These alternatives may require some ROW from Corps land or land with easements held by the Corps for flooding and/or flowage protection. This need is not detrimental to the implementation of any of these alternatives and is equal to all of these alternatives.				
Section 7(a) Evaluation, Wild and Scenic Rivers Act	NPS evaluates the impact of the Applied-for Project on the outstandingly remarkable values for which the MNRR was established by Congress under Section 7(a) of the Wild and Scenic Rivers Act. Only NDOR's Applied-for Project would be evaluated in context of Section 7(a). NPS is a cooperating agency on the Project and has not indicated that an alternative could not be implemented as a result of the Section 7(a) Evaluation.				
Does this alternative meet logistics criteria?	Yes	Yes	Yes	Yes	No (east segment) As an avoidance alternative, it was determined that the west segment is a redundant alternative to the west segment of Alternative B1 with no distinct advantages and more impacts to aquatic habitat. Therefore, neither the east segment nor the west segment would be carried forward for detailed analysis in the EIS.

Notes:

ROW = right-of-way

NDOR = Nebraska Department of Roads

Corps = U.S. Army Corps of Engineers

NPS = National Park Service

MNRR = Missouri National Recreational River

EIS = Environmental Impact Statement

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2.5.3 Cost Screening Results

The Section 404(b)(1) guidelines do not provide specific methods for determining the practicability of project costs or unreasonable expense. However, other regulatory guidance documents state that “the determination of what constitutes an unreasonable expense should generally consider whether the projected cost is substantially greater than the costs normally associated with the particular type of project” (EPA and Corps 1993, Corps 1999).

During screening, NDOR developed extensive cost estimates for each of the alternatives. The project scope and existing natural conditions are unique, specifically those related to eliminating flood damage and frequent maintenance along a transportation corridor that lies in a very dynamic hydrologic, ecologic, and geologic environment. Project alternative costs were considered in context with each other (as detailed later in this section and in Figure 2-10).

In general, screening for cost is performed on a project-by-project basis. A review of past Corps’ EISs for transportation projects shows a cost screening threshold that ranges between 1.5 to 2 times the least costly alternative. Even the least costly alternative is multiple times the cost of a normal rural arterial highway within the state of Nebraska, due to all Action Alternatives being constructed in areas with challenging conditions, such as wetlands and open water or shale. Therefore, the Corps elected to utilize the lower end (that is, 1.5 times the least costly alternative) of the cost range for screening purposes. Alternatives in excess of 1.5 times the least costly alternative were deemed excessive (as detailed later in this section and in Figure 2-10) and therefore not practicable under the Section 404(b)(1) guidelines (40 CFR 230.10 (a)). The threshold of 1.5 times the least costly alternative has been used in two other Corps’ EISs—the Legacy Parkway project in Salt Lake City, Utah and the Two Forks Dam project in Denver, Colorado—and has withstood litigation.

The total cost estimate of a roadway includes preliminary engineering, roadway and grading (including culverts, seeding, bridges, guardrail, and surfacing), acquisition of ROW and maintenance of access to parcels, utility relocation and/or other design considerations, construction engineering costs, and contingencies.

Alternatives Refinement for Cost Estimates

In screening on practicability for cost, it was determined that the alternatives carried forward should be refined to ensure the validity of this phase of the practicability screening process. Because the floodplain alternatives (Alternatives A1, A2 and A3) may require design accommodations to span wetlands and maintain floodplain connectivity (avoidance and minimization techniques relative to changes in design) and the bluffs alternatives (Alternatives B1 and B2) may require design accommodations to allow for constructability in Pierre Shale, both of which may result in increased costs, the Corps opted to refine these alternatives prior to screening.

Floodplain Alternatives Refinement

During the agency scoping meeting held on August 28, 2008, and during subsequent scoping efforts, NPS and the Ponca Tribe of Nebraska requested that the EIS consider a pierced or elevated roadway option that would span wetlands or those areas that are susceptible to flooding. In a subsequent meeting with the cooperating agencies on December 11, 2008, NPS again requested an option that would incorporate additional bridges to minimize impacts on wetlands and maintain floodplain connectivity; this option would not need to span the entire project but could focus on areas of greatest importance. On two other occasions (January 12, 2009, and July 8, 2009), the Corps met with NPS, USFWS, and NGPC to request information regarding the resource agencies’ preferences of which areas should be spanned to improve floodplain connectivity.

If additional or larger bridges or culverts are added, the cost of the alternative is expected to increase. The Corps was concerned that if the additional cost for more or larger bridges or culverts was not analyzed during practicability screening, then screening out alternatives based on cost could be invalid. After the cost of additional or larger bridges or culverts is added to the floodplain alternatives (Alternatives A1, A2, and A3), the difference in cost between those and other alternatives would change. Therefore, the Corps chose to perform additional cost analyses on Alternatives A1, A2, and A3 as they relate to the location and size of bridges and culverts during practicability screening so that a more representative cost is used for screening.

The type, size, and location of bridges and culverts (structures) in Alternatives A1, A2, and A3 were analyzed for floodplain connectivity and aquatic and terrestrial species movement. Table 2-2 summarizes all of the data reviewed for the analysis, indicating if and where the information is located in the Draft EIS.

Table 2-2
Data Reviewed in the Floodplain Alternatives Analysis for Floodplain Connectivity

Data	Purpose	Location in Draft EIS
Past correspondence	Reviewed resource agency concerns documented in past correspondence and meeting notes from 2003 through 2006 and NDOR's records of communication with wildlife passage experts.	N/A
Meetings with natural resource agencies	Held meetings with EPA, NPS, USFWS, and NGPC, and contacted Niobrara State Park to discuss terrestrial and aquatic species and floodplain connectivity in the Study Area.	Chapter 6 and Appendix N
Wetland determination and delineation	Analyzed the placement of culverts and bridges in relation to the wetland determination and delineation.	Wetland delineation in Appendix F
Unique wetlands	Documented the lack of unique or functional special wetlands observed during the preliminary wetland determination.	Appendix F
Land use	Visually observed and documented land use along the proposed project alignments in September 2008.	Appendix F
Published literature	Reviewed relevant literature from the Massachusetts Department of Fish and Game and the U.S. Forest Service regarding aquatic organism passage and culvert criteria.	N/A
Case study	Reviewed information supplied by EPA on ranking and replacing low water road crossings in Missouri to improve habitat for the Niangua darter, a federally listed threatened fish species.	N/A
N-12 roadkill data	Reviewed roadkill data collected along N-12 by NGPC and NDOR to determine types of animals that are crossing N-12 and locations where those animals are being injured or killed.	Chapter 3
EPA culvert criteria	Used best management practices for fish passage, stream continuity, and some wildlife passage.	N/A

Notes:

NDOR = Nebraska Department of Roads

N/A = Not applicable

EPA = U.S. Environmental Protection Agency

NPS = National Park Service

USFWS = U.S. Fish and Wildlife Service

NGPC = Nebraska Game and Parks Commission

N-12 = Nebraska Highway 12

NDOR's bridge engineering group reviewed the agency preferences for spanned areas. They applied methodology that would be used for design of an elevated roadway option (see Appendix B). Based on this guidance, NDOR developed elevated roadway options.

These alternatives are referred to as Alternative A4, Parallel Elevated Alignment and Alternative A7,¹ Base of Bluffs Elevated Alignment. Alternative A4 would have the same alignment as Alternative A2 and Alternative A7 would have the same alignment as Alternative A3 (see Figures 2-7a and 2-7b and Figures 2-8a and 2-8b). No elevated roadway option was developed for Alternative A1 because the intent of the concept was met by having an elevated roadway option for an alternative along the existing alignment and one at the base of the bluffs on a new alignment.

Alternative A4, Parallel Elevated Alignment

Alternative A4 involves constructing the road on a raised-elevation alignment parallel and adjacent to existing N-12 for both the east and west segment, the same alignment as Alternative A2. This alternative would incorporate 19,129 feet (3.6 miles) of bridges. Portions of this alternative would be constructed north of existing N-12 while other portions would be constructed south of existing N-12, dependent on site constraints and design requirements (see Figures 2-7a and 2-7b).

This alternative would be constructed at an elevation approximately 8.5 feet and 9 feet above the projected water surface elevation of the Missouri River 50 years into the future (based from 2013) during a 100-year flood event (including compensation for potential wave action, assumed to be 3.5 feet [NDOR 2013]). Roadway design would involve 12-foot driving lanes and 8- to 10-foot shoulders. The west segment is 6.2 miles long, the east segment is 6.0 miles long, and the N-14 segment is 0.9 mile long.

A wave attenuation berm that would range in length (15-foot minimum) would be incorporated on the north side of the roadway into those sections where the new highway embankment would be shifted to the south of the existing highway section. The wave attenuation berm with a vegetative wave break was designed to take advantage of the existing highway embankment where applicable (see Figure 2-4). Where the new highway embankment would be located along (Existing Alignment) or located north of (Parallel Alignment) the existing highway, a standard 3H:1V embankment section would be used with rock riprap placed along the 3H:1V slope of the embankment (NDOR 2009b). See Figure 2-1c, for a typical section in floodplain and a typical section in areas that are not located within a floodplain. These design features satisfy current NDOR design standards and would facilitate an adequate LOS for east-west traffic.

Alternative A7, Base of Bluffs Elevated Alignment (NDOR Applied-for Project)

Alternative A7 is the same alignment as Alternative A3, but incorporates 9,302 feet (1.8 miles) of bridges. This alternative would shift the roadway alignment south to the base of the Missouri River bluffs (see Figures 2-8a and 2-8b) and would be a new travel corridor. However, there are many locations where this alternative's alignment is identical to Alternative A1 or A2 due to the proximity

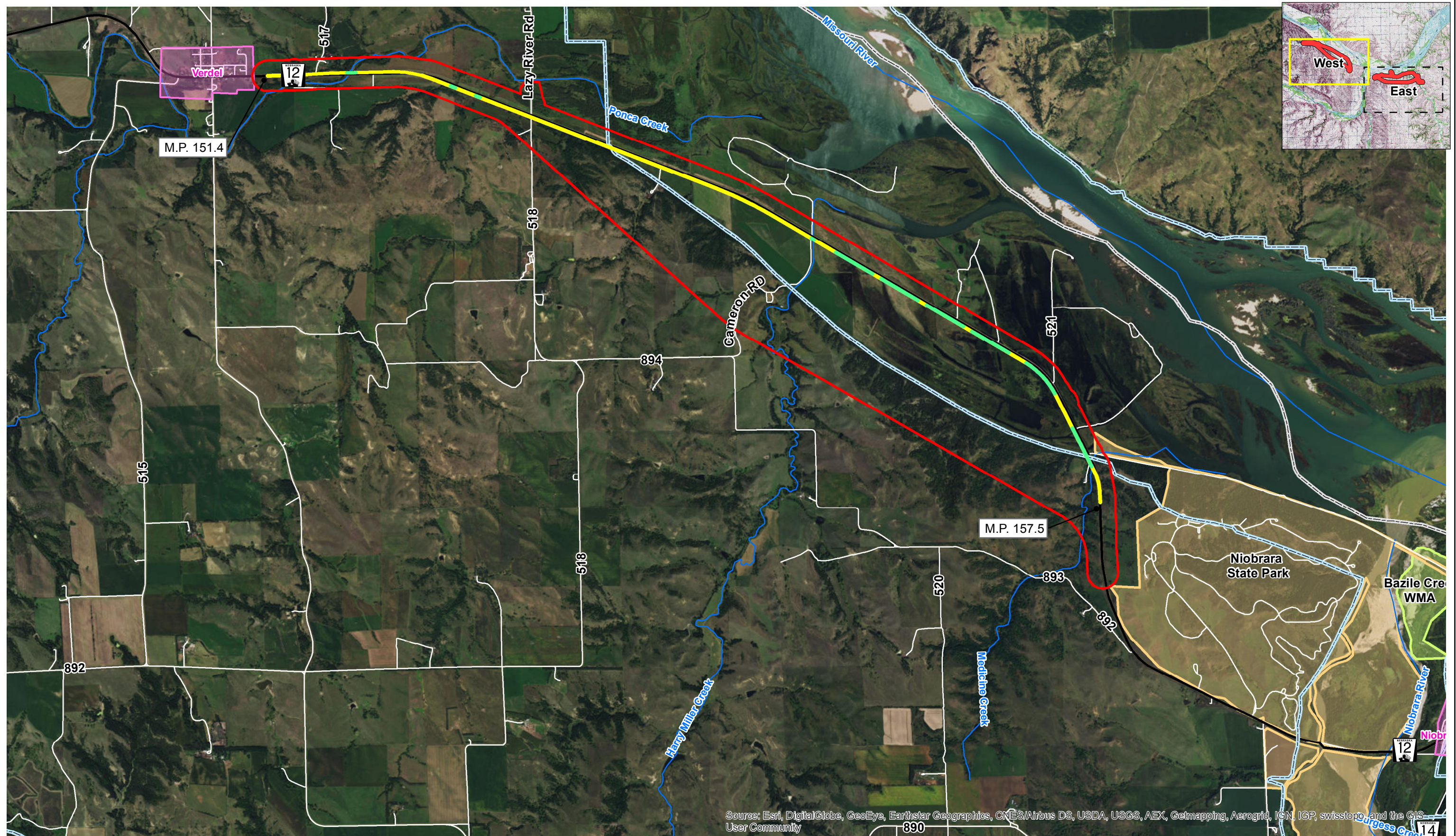
¹ Alternatives A5 and A6 were developed as part of the bridge alternative refinement process. They were iterations of the same concept, that is, an elevated roadway following Alternative A2 alignment and Alternative A3 alignment, respectively. Alternatives A5 and A6 were conceptually redundant to Alternatives A4 and A7, with the primary difference being the location, spacing requirements, and length variations of bridges. Therefore, Alternative A5 and A6 were not advanced, and the Alternative A4 and A7 represent the elevated roadway alternatives on the Alternative A2 and Alternative A3 alignments, respectively.

of the bluffs to the Missouri River. In the west segment, this alternative would deviate from the existing N-12 alignment just east of Ponca Creek and would rejoin the existing alignment just north of County Road 892. In the east segment, the alignment would deviate from the existing alignment east of 4th Avenue in Niobrara and would reconnect with existing N-12 at approximately S-54D. A new connection to the Chief Standing Bear Memorial Bridge and SD-37 would be developed.

Although still in the 100-year floodplain of the Missouri River, as designated by FEMA, this alternative moves the alignment to the southern extreme of the floodplain where possible. A new connection to the Chief Standing Bear Memorial Bridge and SD-37 would be developed. For both segments, where the new alignment deviates from the existing N-12 alignment, the N-12 roadway would be removed to the existing ground level. Roadway removal includes all pavement and roadway embankment.

This alternative would be constructed at an elevation approximately 9 feet and 11.5 feet above the projected water surface elevation of the Missouri River 50 years into the future (based from 2013) during a 100-year flood event (including compensation for potential wave action, assumed to be 3.5 feet [NDOR 2013]). Roadway design would involve 12-foot driving lanes and 8- to 10-foot shoulders. Construction of a road at the Alternative A3 location would include total elimination of the entire existing N-12 roadway embankment; therefore, no wave attenuation berm would be incorporated. Segments of this alternative within the floodplain would use a standard 3H:1V embankment section with rock riprap placed along the 3H:1V slope of the embankment (NDOR 2009b). Typical cross sections for Alternative A3 (not within a floodplain and within the floodplain) are shown in Figure 2-3c. These design features satisfy current NDOR design standards and would facilitate an adequate LOS for east-west traffic.

The new roadway would be constructed on a predominantly new alignment. The new alignment, in association with a system of shoofly connections and temporary roads, would maintain traffic on both lanes of the existing roadway during construction. Existing intersections with county roads and private crossings would remain open during construction to the greatest extent possible. The west segment is 6.1 miles long, the east segment is 6.0 miles long, and the N-14 segment is 0.9 mile long.

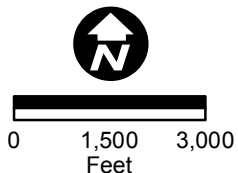


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Legend

- | | | |
|------------------------------|-----------------------------|-------------|
| Alignment for Alternative A4 | Recreational River Boundary | Study Area |
| Bridge | State Park | City Limits |
| Santee Sioux Nation | Wildlife Management Area | Counties |
| Nebraska Highway 12 | | |
| Waterways | | |



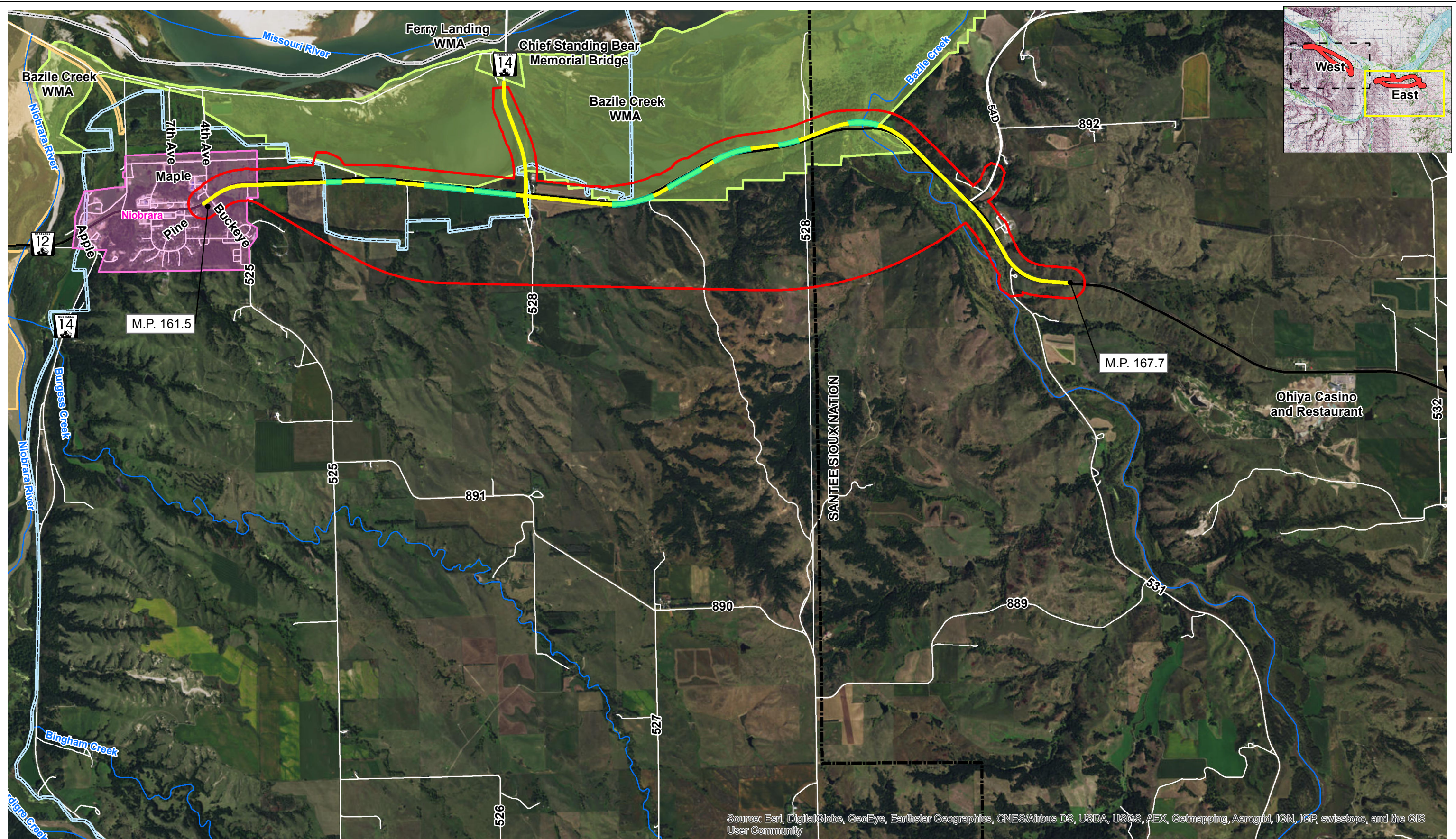
**Alternative A4
West Segment**

N-12 Niobrara East and West
Knox County, Nebraska
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DATE
October 2015

FIGURE
2-7a



Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Legend

- | | | |
|------------------------------|-----------------------------|-------------|
| Alignment for Alternative A4 | Recreational River Boundary | Study Area |
| Bridge | State Park | City Limits |
| Santee Sioux Nation | Wildlife Management Area | Counties |
| Nebraska Highway 12 | | |
| Waterways | | |



0 1,500 3,000
Feet

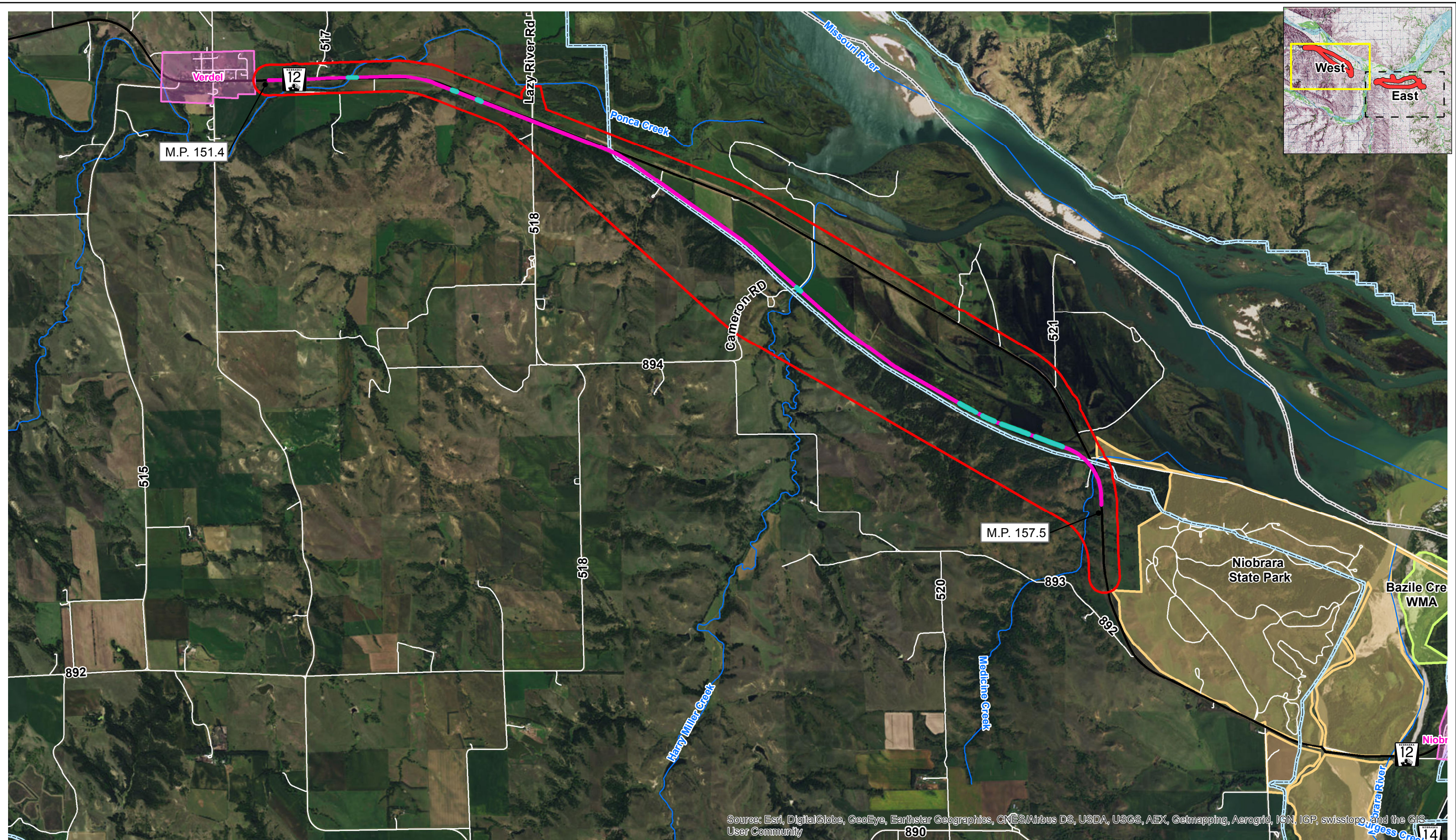
Alternative A4 East Segment

N-12 Niobrara East and West
Knox County, Nebraska
Environmental Impact Statement



DATE
October 2015

FIGURE
2-7b

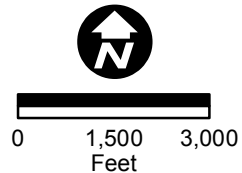


Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Legend

- | | | |
|------------------------------|-----------------------------|-------------|
| Alignment for Alternative A7 | Recreational River Boundary | Study Area |
| Bridge | State Park | City Limits |
| Santee Sioux Nation | Wildlife Management Area | Counties |
| Nebraska Highway 12 | | |
| Waterways | | |

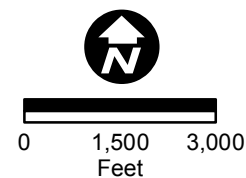
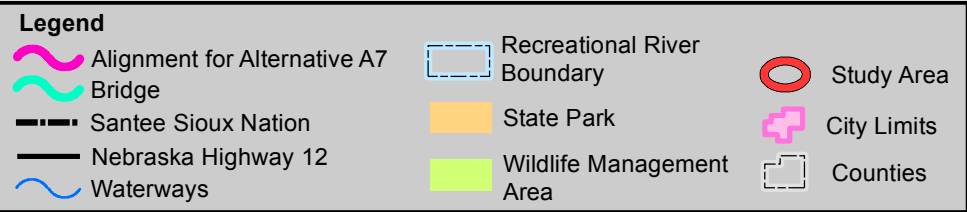
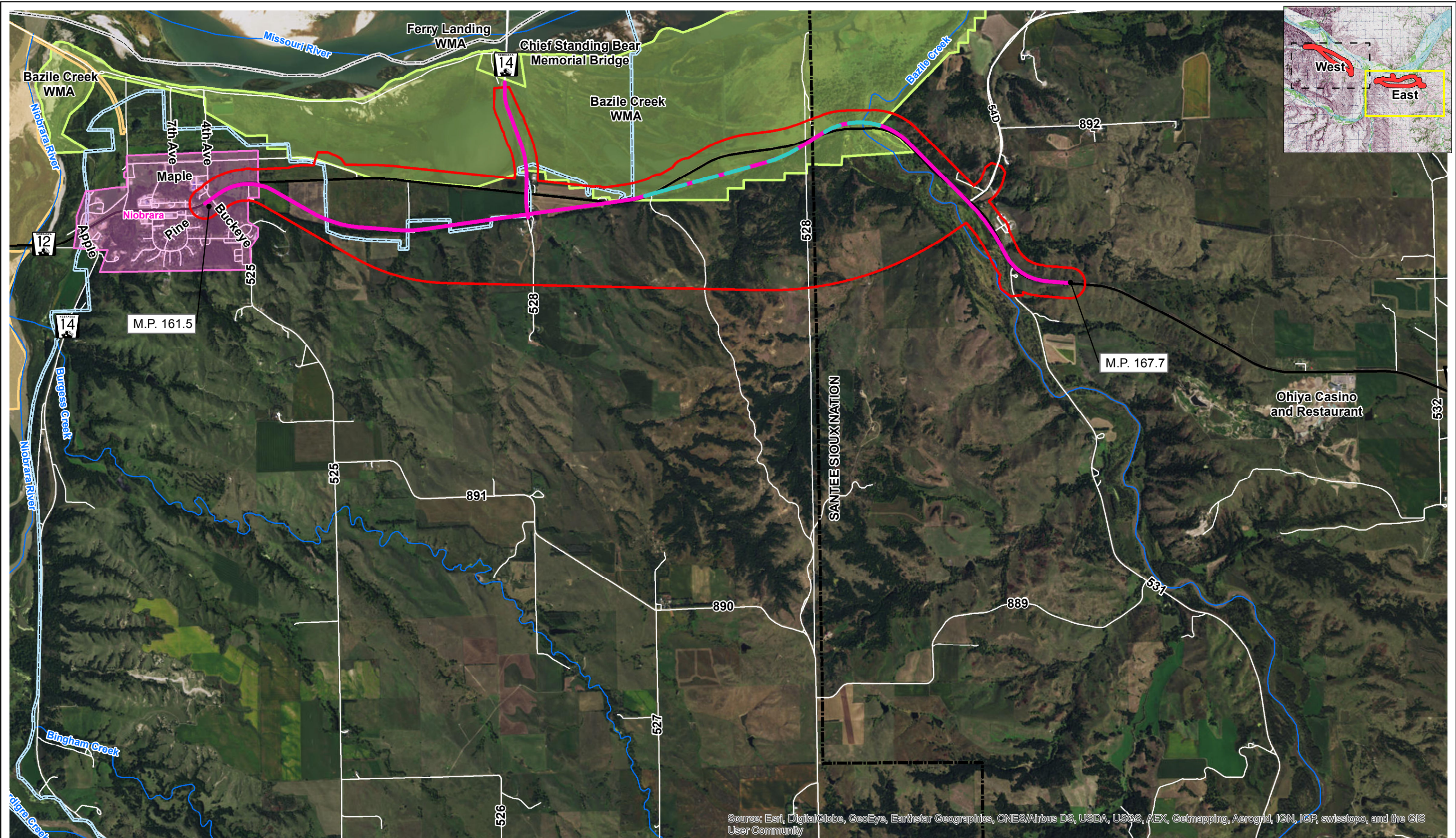


NDOR's Applied-for Project - Alternative A7
West Segment
N-12 Niobrara East and West
Knox County, Nebraska
Environmental Impact Statement



DATE
October 2015

FIGURE
2-8a



NDOR's Applied-for Project - Alternative A7
East Segment
N-12 Niobrara East and West
Knox County, Nebraska
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DATE	October 2015
FIGURE	2-8b

Bluffs Alternatives Refinement

As described in Section 2.2.1, General Concepts, the bluffs alternatives would require design accommodations in the areas of Pierre Shale geologic formations. Therefore, during practicability screening for cost, the Corps reviewed and considered additional NDOR analyses related to the design refinements to allow for constructability in Pierre Shale so that a more accurate cost is used for screening.

The Pierre Shale geologic formation, present in a considerable portion of the bluffs south of the Missouri River, is prone to landslides and is likely not suitable for roadway construction without design modifications beyond NDOR's general design standards. Conditions in northeast Nebraska that facilitate landslide potential on Pierre Shale geologic formations include the rugged, sloping topography and the relative precipitation of the region.

The Corps understands that considerations specific to roadway construction on Pierre Shale geologic formations must be incorporated for Alternative B1 to satisfy the purpose of providing a reliable and safe transportation corridor. NDOR has established design criteria for design of Alternative B1 to mitigate for the Pierre Shale geologic formations (see Appendix B). The following design criteria were used in developing the design (and cost) of Alternative B1 (see Figure 2-9 for a typical cut section in problem Pierre Shale areas):

- An increase in standard embankment sideslopes from 3H:1V to 4H:1V
 - Provides an additional safety factor and greater slope stability
 - Results in excavation and embankment needs beyond that of the standard 3H:1V sideslopes typically used for roadway design
- Construction of drilled horizontal backslope drains and the associated storm sewer system
- Construction of toe berms
- Construction of toe keys
- Waste of excavated Pierre Shale
 - Not suitable for reuse as roadway embankment
 - Must be properly disposed of at an off-site location
- Removal of shale knobs in slide prone areas
- Placement of geogrid
- Use of granular fill
- Construction of cohesive soil caps

What are backslope drains?

Also known as hydrauger drains. This is a drain that is drilled into the backslope to help reduce water levels (pore pressure) in the shale materials.

What is a toe berm?

This is a fill placed at the toe of slope to act as counterweight and help prevent embankment failure.

What are toe keys?

Another term for this is Toe-of-Fill Key (used when placing fill on a slope). It is a keyway that extends a minimum of 2 feet into intact foundation materials on the downslope side. Engineered fill is placed within this key. A drain tile is placed in the bottom with some granular material to drain any water that may collect in the toe key.

What is geogrid?

A geogrid is a geosynthetic material, such as polyester, polyethylene, or polypropylene, used to reinforce soils.

What is a shear key?

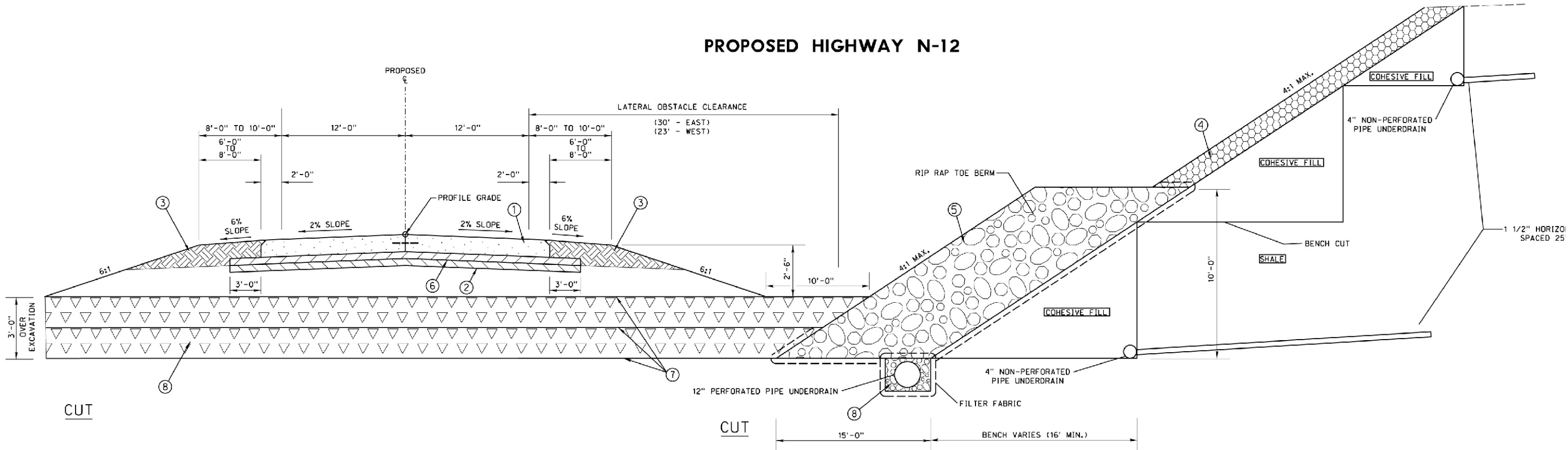
Shear keys are placed at the base of fill slopes at various widths depending on the height of the slope and underlying soils. They are constructed of rock. The depth of shear keys depends on the depth of the shale, from grade to top of shale. Shear keys are placed from the toe of the fill slope down approximately 3 feet into the shale. They are designed on a case-by-case basis after detailed borings have been taken and shale has been located to an acceptable degree.

- Construction of underdrains
- Drain tile at all cut-to-fill and fill-to-cut locations
- Potential use of shear keys where Pierre Shale is present

Noting that the special construction accommodations may result in increased construction costs and subsequently may affect the Corps' practicability screening for cost, the Corps requested that NDOR prepare a cost estimate for Alternative B1 that account for the design criteria detailed above.

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- ① 8" DOWELED CONCRETE PAVEMENT
- ② SUBGRADE STABILIZATION
- ③ SHOULDER CONSTRUCTION
- ④ COHESIVE SOIL CAPPING
- ⑤ EARTH COVERED RIPRAP
- ⑥ FOUNDATION COURSE 4"
- ⑦ GEGRID
- ⑧ 3' GRANULAR FILL
- ⑨ 4" UNDERDRAIN



Preliminary Plan
Not Final
Subject to Change

Note: Horizontal
and Vertical Dimensions
Not to Scale

Typical Cross Section

N-12 Niobrara East and West
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FIGURE
2-9

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Even if the design criteria listed above are implemented, slide potential would still be a concern as the vast majority of available borrow materials in the area consists of granular soils (containing a high percent of sands). The use of the granular fill materials in this area would allow the migration of water into the shale.

Cost Screening

As stated at the beginning of Section 2.5.3, Cost Screening Results, the Corps used the preliminary engineering, grading, roadway (includes culverts, bridges, surfacing, seeding, guardrail, and electrical), ROW acquisition and parcel access costs, utility relocation, general items, construction engineering, and the total cost estimate to screen the alternatives for cost.

Preliminary Engineering

Preliminary engineering includes efforts required to develop a final design for construction of an Action Alternative. The costs for preliminary engineering range from Alternative A3 (\$14.2 million) to Alternatives A4 and B1 (\$25.3 million and \$26.9 million, respectively). Alternative A4 requires the design of long bridges and Alternative B1 requires construction measures for the mitigation of Pierre Shale.

Grading

Grading considerations under this criterion included borrow locations and availability, presence of Pierre Shale, and wave attenuation berms. Borrow for roadway fill is needed for all Action Alternatives. Construction of Alternative B1, due to the greater variation in the terrain (the valleys and the hills) and the presence of Pierre Shale, has a large influence on the grading cost. The steep terrain requires more grading to develop the roadway. The presence of Pierre Shale requires over excavation and removal of the Pierre Shale because it is not usable as fill. Grading costs for the Alternative B1 are \$204.1 million.

Portions of the floodplain alternatives would require wave protection. This can be accomplished through the use of riprap or wave attenuation berms. NDOR has proposed the use of wave attenuation berms for the purposes of cost estimating. Wave attenuation berms use portions of the existing N-12 alignment, creating a vegetated means of wave protection. Standard methods of riprap protection would allow for total removal of the existing N-12 embankment, thus potentially providing compensatory wetland mitigation for unavoidable impacts on wetlands.

Grading costs for the alternatives in the floodplain range from \$54.8 million (A7) to \$86.7 million (A2).

Roadway

Roadway costs include culvert removal and installation, construction of bridges, length of guardrail, surfacing, seeding and landscaping, and electrical requirements. The construction of bridges causes the greatest cost difference of roadway costs between Alternatives A1, A2, A3, and B1, and the elevated roadway options of Alternatives A4 and A7. The cost of bridges for Alternatives A4 and A7 are \$191.2 million and \$93.6 million, respectively. The following compares the costs of the other items in the roadway category:

- Culvert costs – range from \$5.5 million (A4) to \$16.4 million (B1)
- Concrete pavement costs – range from \$14.2 million (A4) to \$24.1 million (A1)
- Seeding costs – range from \$368,700 (A7) to \$618,300 (B1)

- Guardrail costs – range from \$144,500 (A1) to \$482,300 (A4)
- Electrical costs – identical costs of \$68,600 for all Action Alternatives

Right-of-Way Acquisition and Parcel Access

Construction of new or expanded alignments requires NDOR to acquire new ROW. Alternatives A1, A2, and A4 use existing ROW to the extent possible, while Alternatives A3, A7, and B1 are predominately on new alignments. In addition, all alignments would need to maintain parcel access for private landowners. Parcels for which access cannot be maintained would be acquired. The costs for ROW acquisition and parcel access for Alternatives A1, A2, and A4 is \$395,000, while the costs for Alternative A3 and A7 are \$8.7 million. The cost for ROW for Alternative B1 is \$7.4 million. Costs for acquiring ROW and maintaining parcel access are included in the total cost estimate.

Utility Relocations and/or Design Considerations

Utilities costs include utility adjustments and installation of any new utilities. Appendix C, Section C.6.4, describes the utilities present in the Study Area. Utility costs range from \$3.7 million (A3) to \$7.8 million (B1).

General Items

General items are equipment rental, traffic control devices, and silt fences. Costs for general items ranged from \$1.6 million (A4 and A7) to \$5.8 million (A3).

Construction Engineering

Construction engineering includes the costs to plan and manage construction of the project. Alternatives A1, A2, A3, and A7 have similar costs ranging from \$9.0 million (A3) to \$12.1 million (A7). Alternatives A4 and B1 have the highest costs, at \$18.7 million and \$18.9 million, respectively.

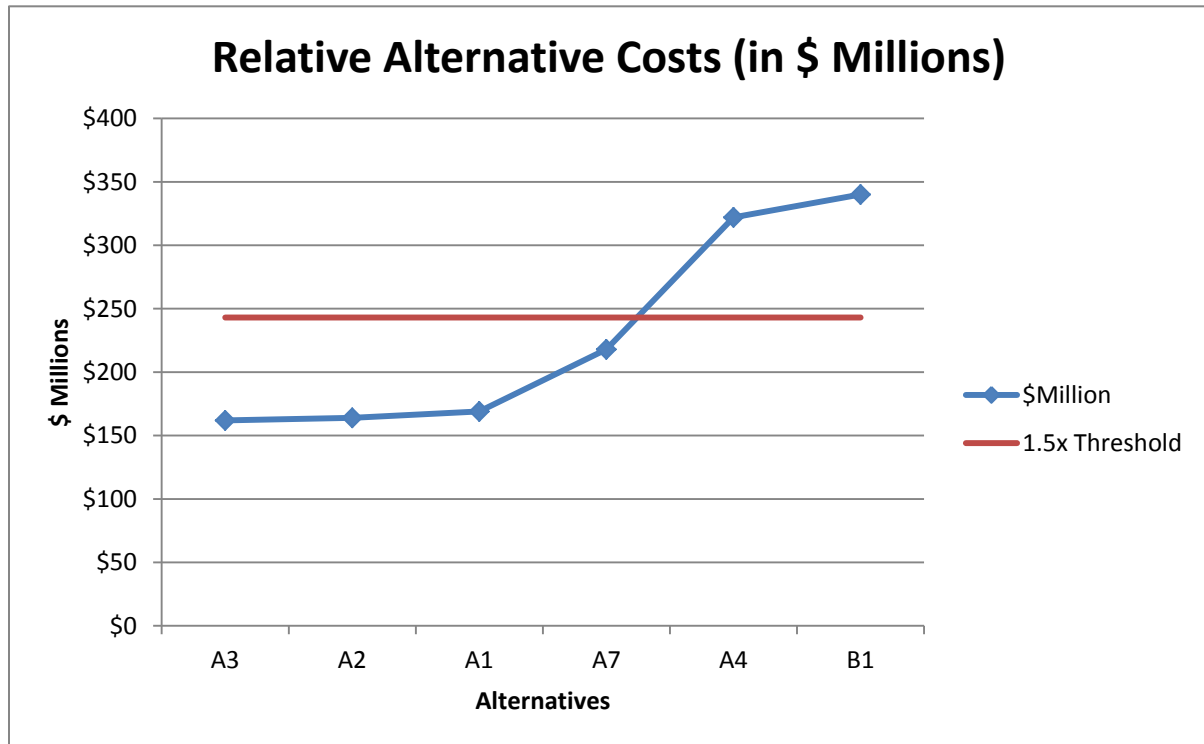
Total Cost Estimate

The total cost estimates, including the above-listed factors, were compared to one another. As stated above, NDOR prepared detailed cost estimates for Alternatives A1, A2, A3, A4, A7, and B1. These costs range from \$161.8 million to \$340.0 million and are as follows (see Table 2-3):

- Alternative A1, Existing Alignment – \$168.8 million
- Alternative A2, Parallel Alignment – \$164.0 million
- Alternative A3, Base of Bluffs Alignment – \$161.8 million
- Alternative A4, Parallel Elevated Alignment – \$322.2 million
- Alternative A7, Base of Bluffs Elevated Alignment – \$217.6 million
- Alternative B1, Bluffs Alignment – \$340.0 million

Cost Screening Summary

Alternatives A4 and B1 are above the threshold of 1.5 times the least costly alternative (1.5 times the Alternative A3, Base of Bluffs, cost of \$161.8 million, for a cost threshold of \$242.7 million). In addition to the threshold of 1.5 times the least costly alternative, a graphical representation of the differences in costs of alternatives, shown in Figure 2-10, was considered.



Note: The cost threshold of 1.5 times the least costly alternative (Alternative A3, Base of Bluffs, \$161.8 million) is \$242.7million.

Figure 2-10 Relative Costs of N-12 Alternatives

Figure 2-10 indicates that there are two distinct groups of alternative costs when organized from least costly to most costly. Alternatives A1, A2, A3, and A7 range in cost from \$161.8 million (Alternative A3) to \$217.6 million (Alternative A7). The cost differential between A3 and A7 is \$55.8 million. Alternatives A4 and B1 are separated from A7 by a cost differential of \$160.4 million and \$178.2 million, respectively. Therefore, through review of the alternative cost distribution, there is a group of alternatives between \$161.8 million and \$217.6 million and a group of alternatives between \$322.2 million and \$340 million. Alternatives A4 and B1 are above the threshold of 1.5 times the least costly alternative.

Based on the cost considerations discussed above, and a visual observation of groupings of the Action Alternatives and the 1.5 times cost threshold, Alternatives A1, A2, A3, and A7 are practicable based on cost and would be included in the evaluation in the EIS. Alternatives A4 and B1 can be dismissed from further evaluation in the Draft EIS because the Corps determined that they are not practicable in terms of cost.

The cost estimates for each Action Alternative and results of cost screening are summarized in Table 2-3.

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Table 2-3
Screening of Alternatives on Practicability – Cost¹

Cost Screening Criteria	A1 – Existing Alignment	A2 – Parallel Alignment	A3 – Base of Bluffs Alignment	A4 – Parallel Elevated Alignment	A7 – Base of Bluffs Elevated Alignment (Applied-for Project)	B1 – Bluffs Alignment
Preliminary engineering	\$15.3M	\$15.0M	\$14.2M	\$25.3M	\$17.8M	\$26.9M
Grading	\$82.6M	\$86.7M	\$71.8M	\$56.7M	\$54.8M	\$204.1M
Roadway	\$53.5M	\$46.5M	\$48.6M	\$211.8M	\$117.5M	\$73.0M
Right of Way and Parcel Access	\$395,000	\$395,000	\$8.7M	\$395,000	\$8.7M	\$7.4M
Utilities	\$4.1M	\$4.0M	\$3.7M	\$7.7M	\$5.0M	\$7.8M
General Items	\$2.9M	\$1.7M	\$5.8M	\$1.6M	\$1.6M	\$1.9M
Construction engineering	\$10.0M	\$9.7M	\$9.0M	\$18.7M	\$12.2M	\$18.9M
Total cost estimate	\$168.8M	\$164.0M	\$161.8M	\$322.2M	\$217.6M	\$340.0M
Does this alternative meet cost criteria?	yes	yes	yes	no	yes	no

Note:

M = Million

¹ *Costs provided in 2014 U.S. dollars.*

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2.6 SUMMARY OF ALTERNATIVE SCREENING RESULTS

2.6.1 Alternatives Eliminated from Further Consideration

Alternative A4, Parallel Elevated Alignment

Alternative A4 meets the purpose and need, was logistically practicable, but was found to be not practicable under the Section 404(b)(1) guidelines due to excessive cost (greater than 1.5 times the least costly alternative). Alternative A4 is eliminated from further consideration for detailed analysis in the EIS.

Alternative B1, Bluffs Alignment

Alternative B1 meets the purpose and need, was logistically practicable, but was found to be not practicable under the Section 404(b)(1) guidelines due to excessive cost (greater than 1.5 times the least costly alternative). Alternative B1 is eliminated from further consideration for detailed analysis in the EIS.

Alternative B2, South of Bluffs Alignment

Alternative B2 meets both the purpose and need and practicability screening criteria. However, due to the need to use tribal lands on the east segment of this alternative, the improbability of tribal support for this alternative, and the lack of eminent domain, the east segment of Alternative B2 is not practicable from a logistics perspective because the Project cannot be implemented by NDOR in the east segment. While the west segment of Alternative B2 meets both the purpose and need and practicability screening criteria, this alternative was eliminated from detailed analysis in the EIS because it is redundant to Alternative B1. This is because Alternative B2 has no distinct advantages or distinguishing features from those of Alternative B1 and, as an avoidance alternative, has more impacts on aquatic habitat than Alternative B1.

2.6.2 Alternatives Carried Forward in the EIS

Impacts for each segment of each alternative were considered and reviewed independently for identification of the environmentally preferred alternative.

No-Action Alternative

As explained in Section 2.2.3, Range of Alternatives, the No-Action Alternative does not meet purpose and need, but would be carried forward for detailed analysis in the EIS as required by 40 CFR 1502.14(d) and 1508.25(b).

Alternative A1, Elevation Raise on Existing Alignment

Alternative A1 meets both purpose and need and practicability screening criteria and would be carried forward for detailed analysis in the EIS.

Alternative A2, Parallel Alignment

Alternative A2 meets both purpose and need and practicability screening criteria and would be carried forward for detailed analysis in the EIS.

Alternative A3, Base of Bluffs Alignment

Alternative A3 meets both purpose and need and practicability screening criteria and would be carried forward for detailed analysis in the EIS.

Alternative A7, Base of Bluffs Elevated Alignment (Applied-for Project)

Alternative A7 meets the purpose and need and practicability screening criteria and would be carried forward for detailed analysis in the EIS.

Table 2-4
Summary of Alternatives Carried Forward and Their Attributes

Attribute	A1 – Existing Alignment		A2 – Parallel Alignment		A3 – Base of Bluffs Alignment		A7 – Base of Bluffs Elevated Alignment (Applied-for Project)	
	West	East	West	East	West	East	West	East
Total Length	6.2 miles	6.0 miles	6.2 miles	6.0 miles	6.1 miles	6.0 miles	6.1 miles	6.0 miles
Average Change in Height ¹	15.0 feet	14.1 feet	19.6 feet	18.6 feet	19.0 feet	17.5 feet	19.0 feet	16.0 feet
Total Length of Bridges	1,599 feet/0.3 miles		1,699 feet/0.3 miles		2,100 feet/0.4 miles		9,302 feet/1.8 miles	
Bridge Width	36 feet	40 feet	36 feet	40 feet	36 feet	40 feet	36 feet	40 feet
Number of Bridges	4	1	4	1	5	1	8	6
Number of Culverts	18	16	19	16	23	22	20	17
Lane Width	12 feet	12 feet	12 feet	12 feet	12 feet	12 feet	12 feet	12 feet
Shoulder Width	2 foot surfaced/ 4 foot turf	2 foot surfaced/ 6 foot turf	2 foot surfaced/ 4 foot turf	2 foot surfaced/ 6 foot turf	2 foot surfaced/ 4 foot turf	2 foot surfaced/ 6 foot turf	2 foot surfaced/ 4 foot turf	2 foot surfaced/ 6 foot turf
Posted Speed	60 mph	60 mph	60 mph	60 mph	60 mph	60 mph	60 mph	60 mph

Sources:

NDOR. May 29, 2013. *Principal Controlling Design Criteria*.

NDOR. September 12, 2014. *Bridge Length Comparison*.

NDOR. August 25, 2015. *Existing Drainage Structures on the Niobrara East and West Project*.

Note:

mph = miles per hour

¹ For Alternative A1, the average change in height is between the new road and the existing road. For Alternatives A2, A3 and A7, the average change in height is between the new road and the existing ground, as those alternatives are off alignment.

2.7 SUMMARY OF IMPACTS

Table 2-5 provides a summary of resource impacts for each alternative.

**Table 2-5
Summary of Potential Impacts**

Resource or Issue	No-Action Alternative	Alternative A1	Alternative A2	Alternative A3	Alternative A7 (Applied-for Project)
Wild and Scenic Rivers	No impact	Not evaluated	Not evaluated	Not evaluated	Analysis is on Applied-for Project (see Appendix A)
Fish and Wildlife ¹	Negligible impact on fish and wildlife resulting from any road maintenance repairs	Negligible impact on fish habitat and water quality; negligible impact on agriculture, woodlands, grassland/ rangeland, and wetlands Agricultural Impacts: 2 acres Woodland Impacts: 8 acres Grass/Rangeland: 14 acres Wetland: 147.4 acres	Negligible impact on fish habitat and water quality; negligible impact on agriculture, woodlands, grassland/ rangeland, and wetlands Agricultural Impacts: 6 acres Woodland Impacts: 14 acres Grass/Rangeland: 21 acres Wetland: 142.3 acres	Negligible impact on fish habitat and water quality; negligible impact on woodlands, grassland/ rangeland, and wetlands; Minor impact on agriculture Agricultural Impacts: 23 acres Woodland Impacts: 67 acres Grass/Rangeland: 56 acres Wetland: 122.3 acres	Negligible impact on fish habitat and water quality; negligible impact on woodlands, grassland/ rangeland, and wetlands; minor impact on agriculture Agricultural Impacts: 23 acres Woodland Impacts: 67 acres Grass/Rangeland: 56 acres Wetland: 90.9 acres
Protected Species	No effect	Not likely to adversely affect sturgeon chub, North American river otter, interior least tern, whooping crane, American burying beetle, Northern long-eared bat; no effect on all other listed species			
Water Quality	No impact	Negligible impact on surface water and groundwater			
Wetlands and Waters of the U.S.	No impact	Major impact on wetlands and waters of the U.S. Wetland: 147.4 acres Stream impact: 1,969 feet	Major impact on wetlands and waters of the U.S. Wetland: 142.3 acres Stream impact: 2,741 feet	Major impact on wetlands and waters of the U.S. Wetland: 122.3 acres Stream impact: 2,763 feet	Major impact on wetlands and waters of the U.S. Wetland: 90.9 acres Stream impact: 2,763 feet

Resource or Issue	No-Action Alternative	Alternative A1	Alternative A2	Alternative A3	Alternative A7 (Applied-for Project)
Floodplains	Negligible impact on Missouri River conveyance, floodplain storage, and Lewis and Clark Lake storage	Negligible impact on Missouri River conveyance; major negative impact on floodplain storage and Lewis and Clark Lake storage	Negligible impact on Missouri River conveyance; major negative impact on floodplain storage and Lewis and Clark Lake storage	Negligible impact on Missouri River conveyance, floodplain storage, and Lewis and Clark Lake storage	Negligible impact on Missouri River conveyance, floodplain storage, and Lewis and Clark Lake storage
Visual	Negligible impact	Negligible to major impact	Negligible to major impact	Negligible to moderate impact	Negligible to moderate impact
Cultural Resources	No impact	No impact on known cultural resources			
Recreation	Negative impact on visitor access due to unreliable roadway	Negligible impact on Bazile Creek WMA			
Pedestrians, Bicyclists, and Canoeists	Minor impact of bicyclists' use of N-12	Temporary roadway would cause a temporary minor disruption to bicyclists	Minor beneficial impact on bicyclists use of N-12 due to increased shoulder width	Minor beneficial impact on bicyclists use of N-12 due to increased shoulder width	Minor beneficial impact on bicyclists use of N-12 due to increased shoulder width
Acquisitions and Relocations	No impact	Major impact on ROW; no relocations required			

Note:

N-12 = Nebraska Highway 12

ROW = right-of-way

1. Section 7 of the Endangered Species Act does not apply to state-listed species, but the same affect determination language was used for state-listed species.